

POPULAR MECHANICS MAGAZINE

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JET "TAKE-OFF" FROM MUD
— *Page 102*



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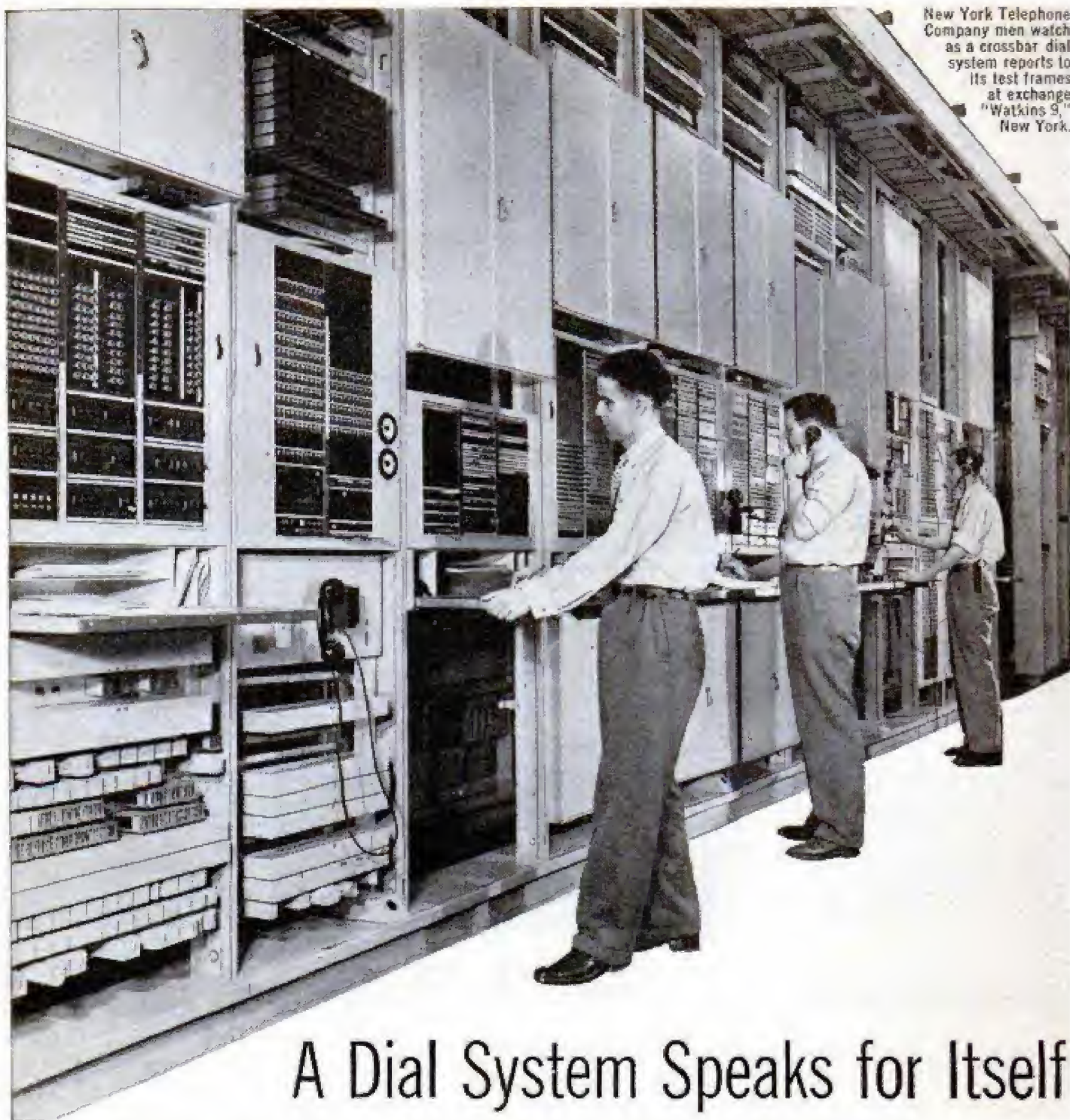
the nails or other sharp objects your tire has picked up. The self-sealing lining then fills the holes and makes permanent repairs. No patches, no expense, no need to take the tire off the wheel!

Seal-o-matics usually outlast two or more sets of tires. They are made with thicker walls than ordinary tubes. These thicker walls resist chafing and pinching. And because air has less chance to work through the thicker rubber, Seal-o-matics hold air pressure longer—help tires to wear better by keeping them properly inflated.

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Next Month

NO FISH STORIES but six pages of tips on catching big ones are in store for anglers in the October issue. PM took Dr. Samuel Eddy, professor of zoology at the University of Minnesota and authority on lake fishing, on a flying fishing trip. Through 20 years of research Doctor Eddy knows what fish eat, where they eat and what time they eat, even to a bedtime snack. In his own words, he tells where to fish and what lures to use.

CLIMB THE LADDER to the gun turret and touch off the Navy's loudest voice in another October feature, "How They Fire the Battleship's Big Guns." Cutaway drawings will show the complicated mechanism required to fire the 16-inch naval rifle, which can hurl a one-ton shell 20 miles. Another story will tell how a little slug of steel has revolutionized precise measurement, and how gauges are used as guides to perfection. All anyone needs is curious hands and a chunk of clay to "Sculpture for Fun," another October yarn.

CHRISTMAS in October? No, but it's time to think about Christmas gifts again, and Santa has suggested that our Craftsman section present a bigger and better story on making toys—a whole month earlier than usual. Pipe smokers, who always seem to have a favorite pipe that's ready for the hospital, will find an October Craftsman article dealing with the repair and refinishing of pipes. The practical shop story for the month describes approved methods of cementing plastics that can be used in any home workshop.

RADIO experimenters will find a simple loudspeaker phone system that also serves as an electronic "nurse," in the October Radio and Electronics section.

Volume 90

SEPTEMBER 1948

Number 3

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IN AN F-80 BUILT FOR TWO

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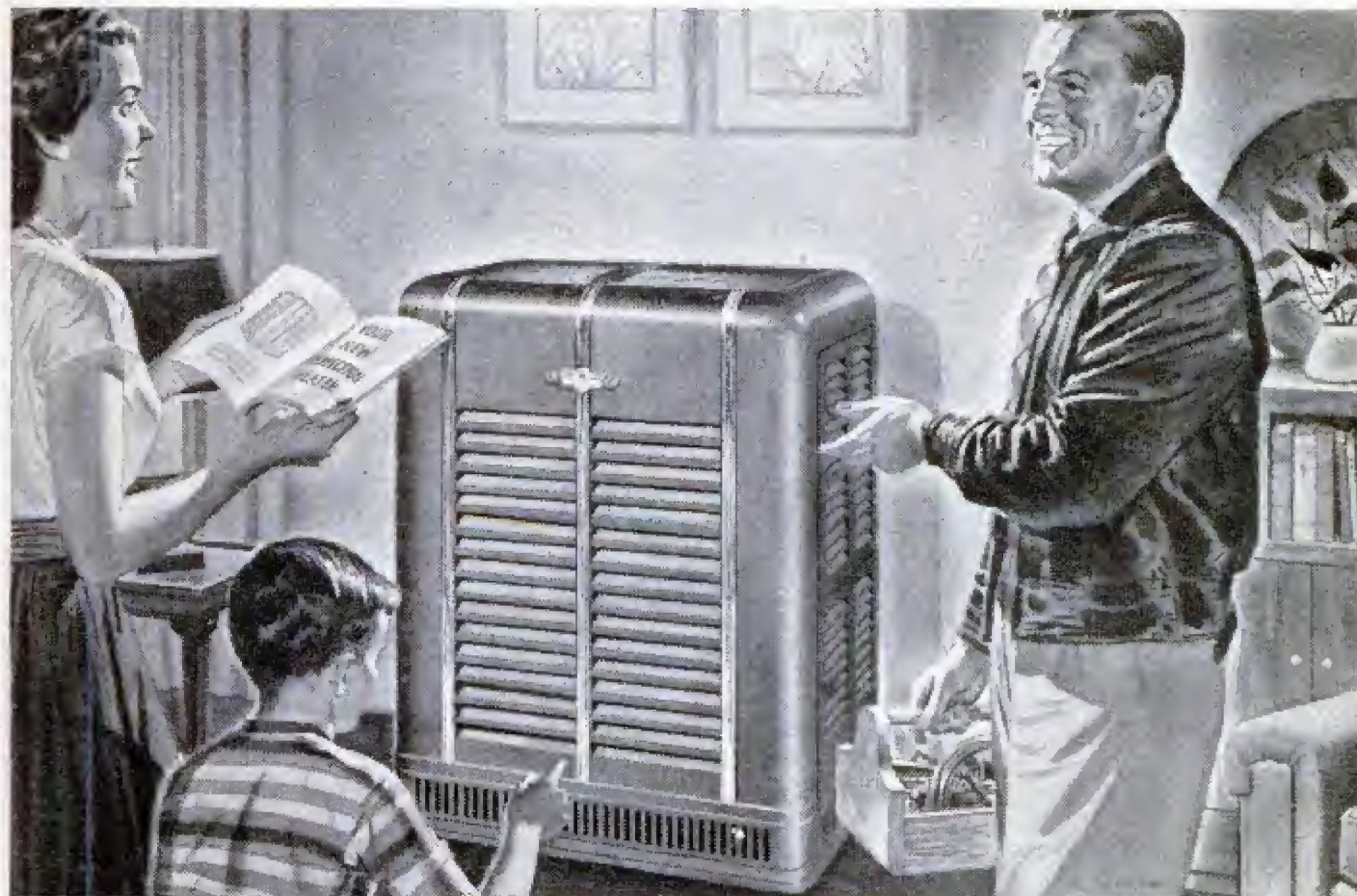
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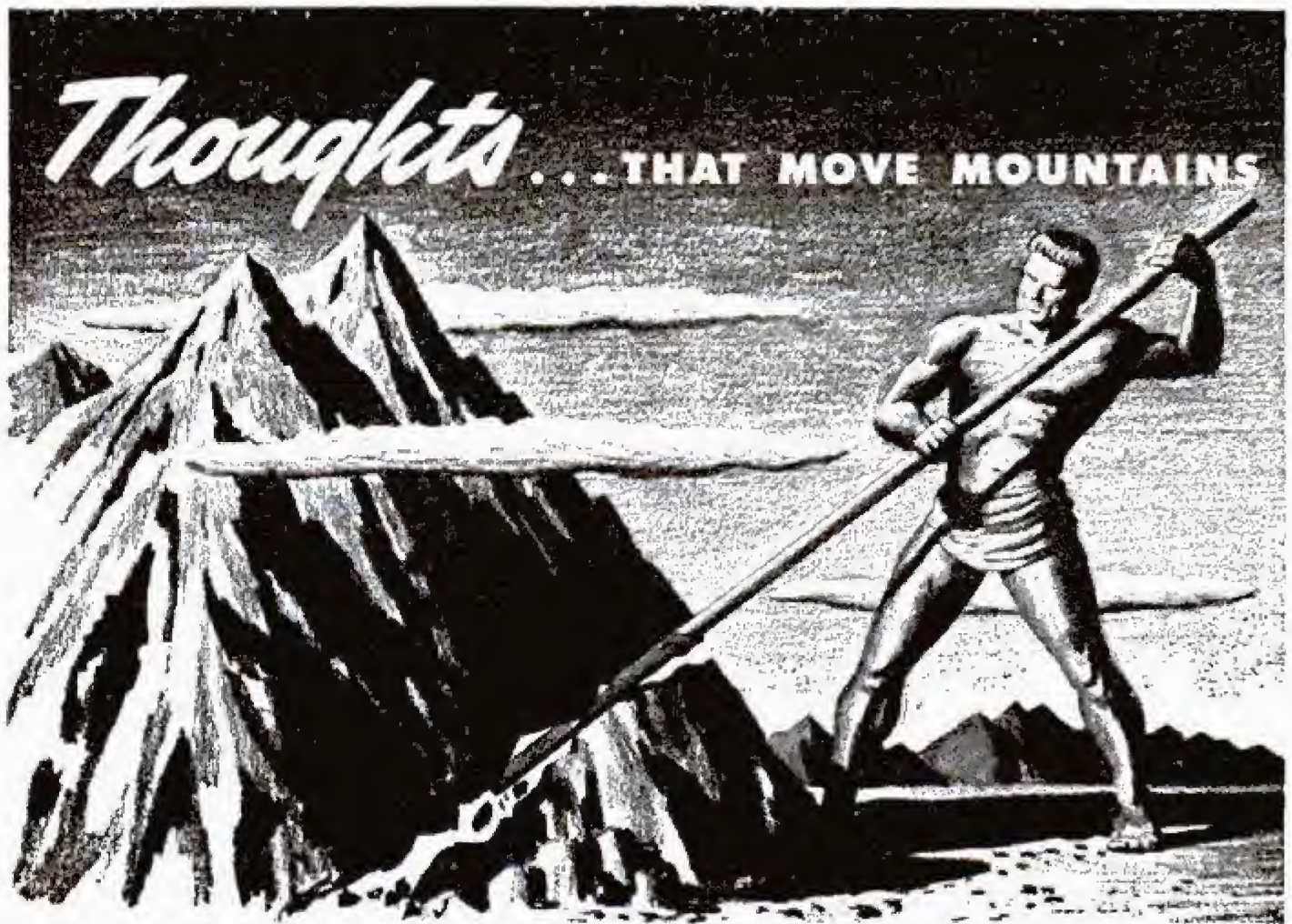
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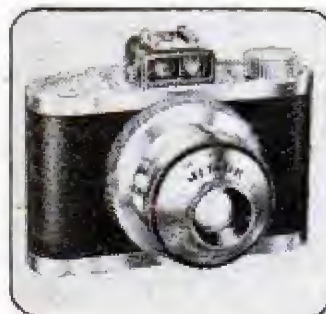
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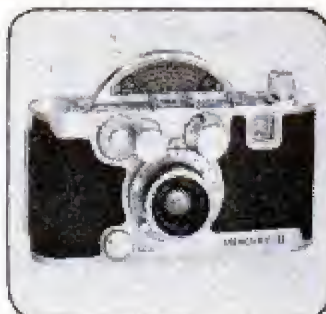
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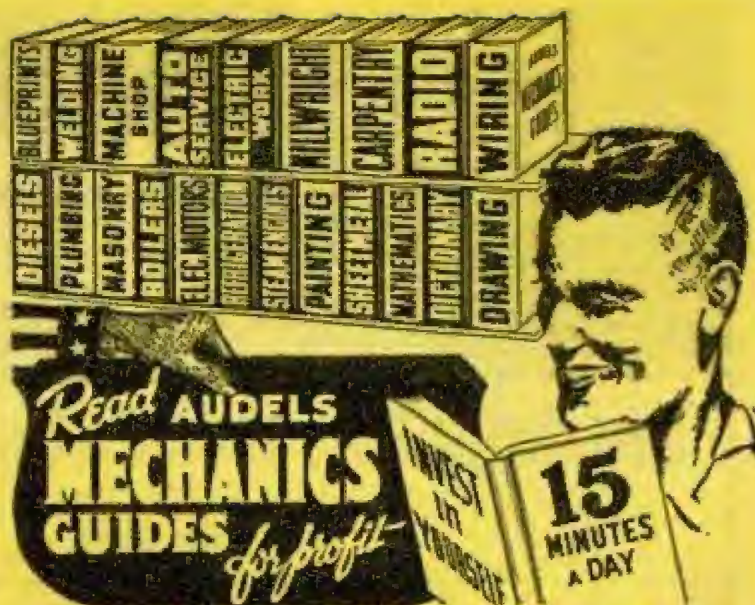
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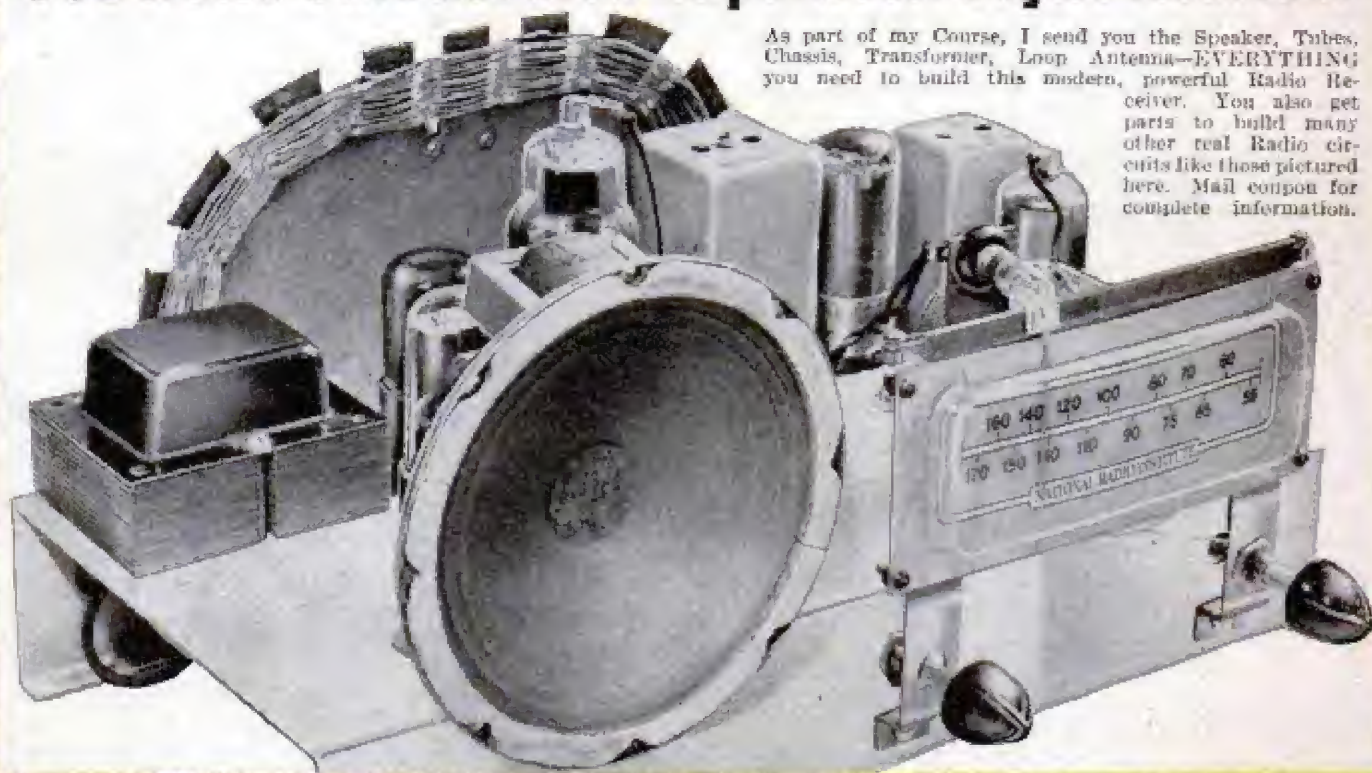
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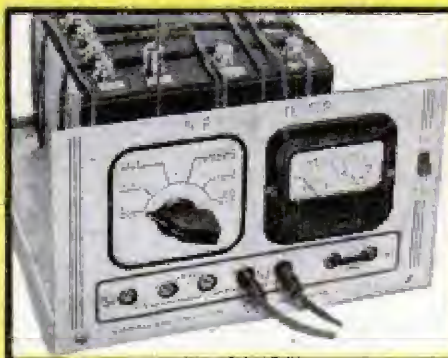
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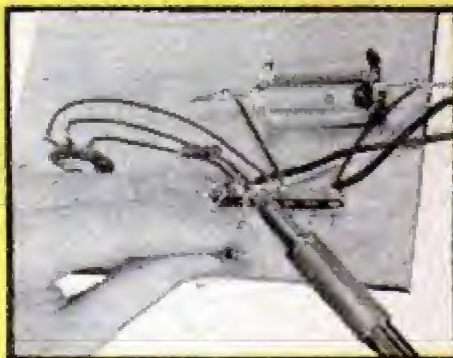
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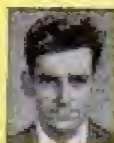
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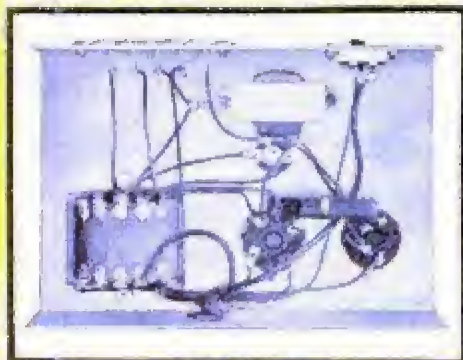
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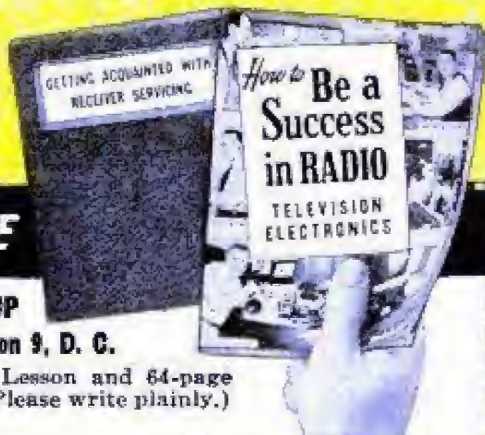
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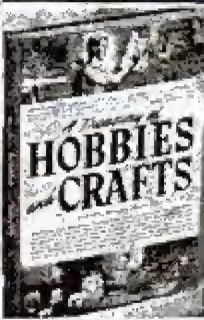
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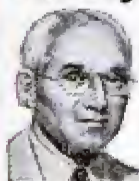
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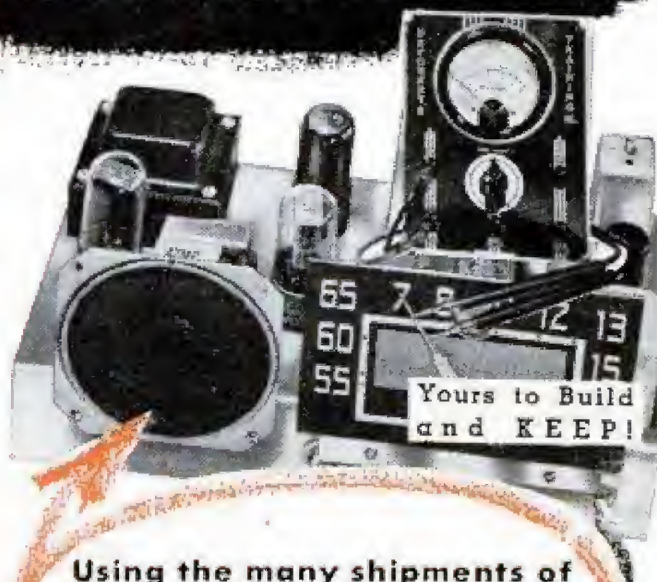
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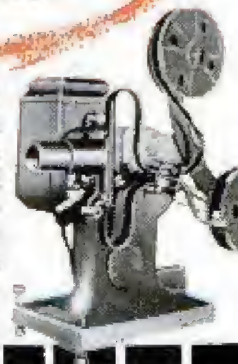
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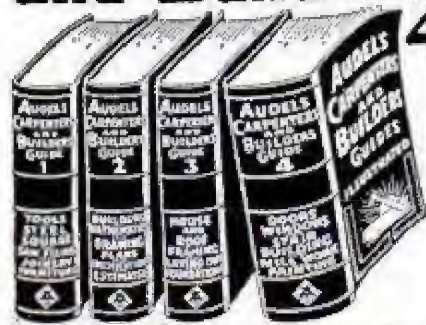
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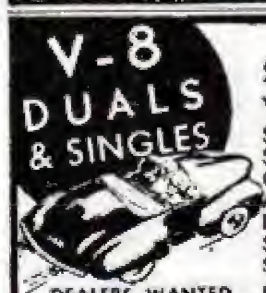
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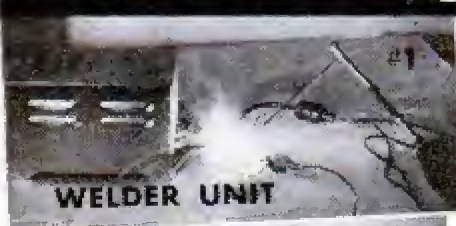
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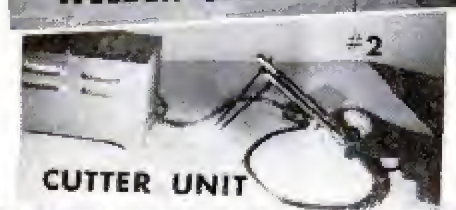
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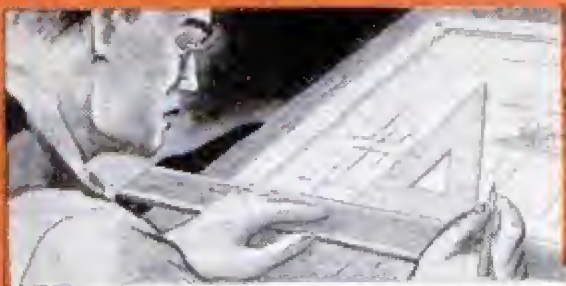
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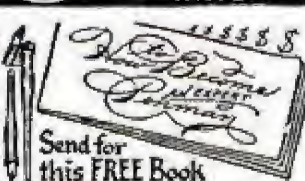
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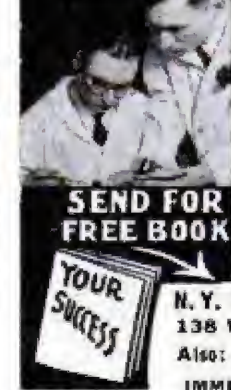
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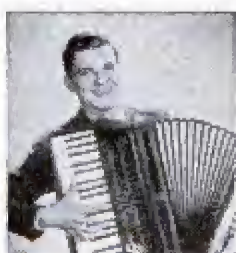
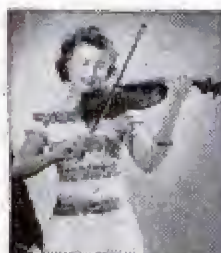


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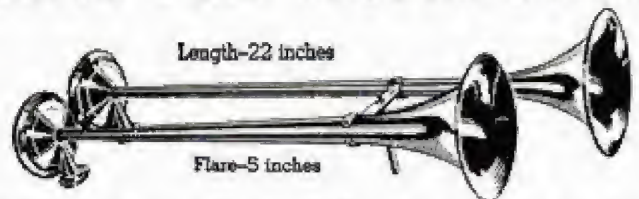


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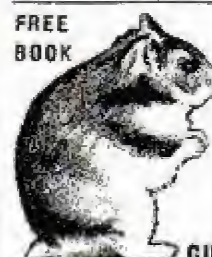
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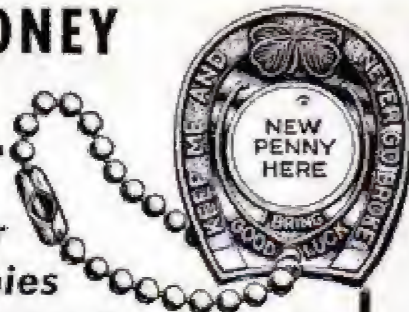
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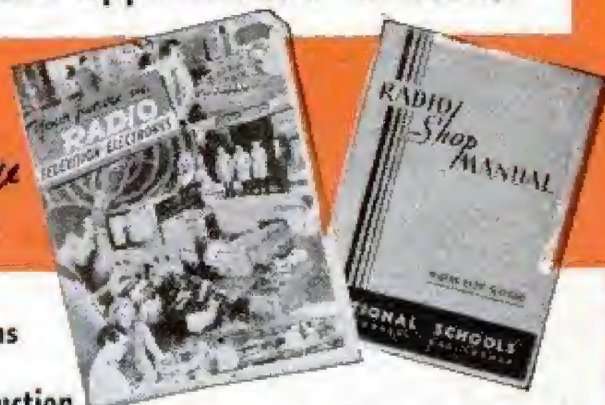
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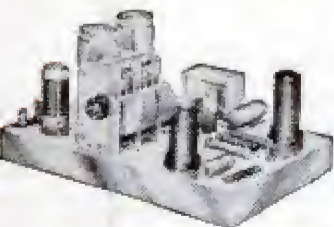


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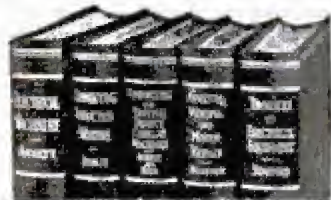
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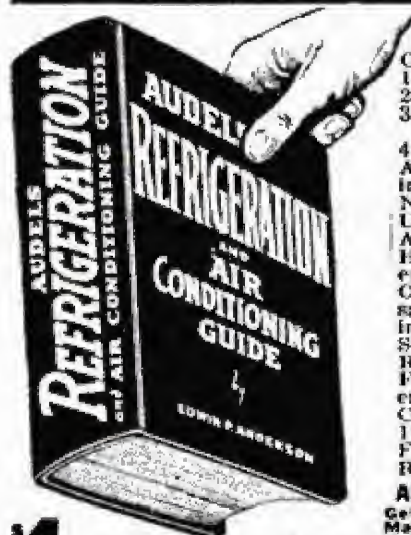
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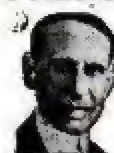
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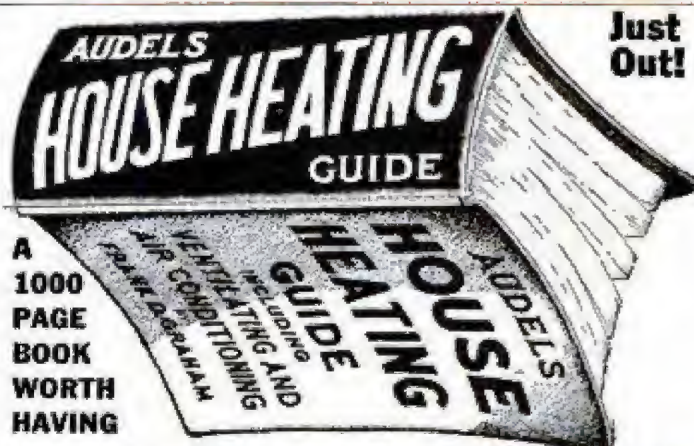
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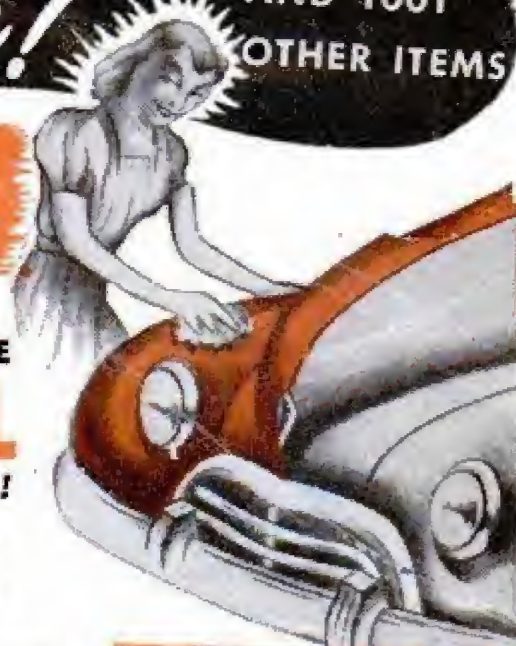
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"FIX Cracked batteries!" Easy! Big profit! Cement \$1.00 can! Details free! Stevens, Grand Junction, Colorado.

CASH For your idea, 280 manufacturers need inventions, patented or unpatented. List free. Invention Bureau, 208M Clinton, Oak Park, Illinois.

ANNOUNCING Home study course in commercial baking. Practical basic training. Good field for those with aptitude. Nearly depression proof. Send for free booklet, "Opportunities in the Baking Industry." National Baking School, 1316 Michigan Ave., Dept. 343C, Chicago 5, Ill.

BELTS! Make 'em and make money. No tools! Sample 50c. Artinc Leather, 411 Joseph Ave., Rochester 5, N. Y.

1000% PROFIT Selling snake orchids. Devour live insects. Enterprises-A, Toronto 12, Canada.

HOSIERY, Handkerchiefs, shirts! Quick shipments. Wholesalers, write for prices Spartan Hosiery Company, Spartanburg South Carolina.

AMAZING Offer! Become successful weekly newspaper publisher! "Know-how" will open all doors to this interesting, lucrative business. Send only \$1 for 50 big pages of priceless information. Buyers say literally worth weight in gold to ambitious reporter, editor, advertising manager, publisher, writer, etc. Yours for only \$1. postpaid. Guaranteed. Hurry! Success Publications, 66 E. Forest, Detroit 1, Michigan.

YOUR Own mail order business at home. New, illustrated course. Free booklet. Registrar, 7219 South Broadway, Los Angeles 3.

MAKE Money sharpening saws at home on electric machine. No experience necessary. Hardware dealers act as your agents to secure work. Send for free book "Independence After 40" shows complete plan for starting in spare time. Foley Mfg. Co., 47 Foley Bldg., Minneapolis 18, Minn.

RESILVER Mirrors at home. Formula 25c. Ideal Service, Park Ridge 6, Illinois.

RUBBER! White liquid rubber! America's finest flexible moulding rubber! New! Extra heavy viscosity! Quick drying! Ideal for home, classroom, or industry. Only \$7.95 per gallon, \$3.95 per quart, and \$1.00 per half-pint sample. Parcel post prepaid! Plastercraft Supply Company, 3051 St. Clair Avenue, Cleveland 14, Ohio.

SPIN Angora wool. Ideal home business. Descriptive circular free. House of Angora, Springfield, Illinois.

VENDING Machines earn big money! An investment as low as \$10.50 will start you in this fascinating, profitable business that can lead you to the road of success and independence. Routes can be established and operated in either full or spare time with no experience needed. Write for full details and our free catalog illustrating our nut, candy, gum and stamp vendors; also slot machines, amusement games, etc. Parkway Machine Corporation, 523 W. North Avenue, Dept. 7, Baltimore 17, Maryland.

NO Selling, operate vendors, amazing profits, details free. Silver-King, 622 Diversey, Chicago 14, Ill.

SPECIAL Rubber for making molds. Literature and sample free. Universal, Box 1076-A, Peoria, Ill.

POPCORN Machines, peanut roasters, caramelcorn equipment, griddles, gasoline, bottled gas appliances. Northside Sales, Indianapolis, Iowa.

HOW And where to obtain capital. Small and large loans. Free particulars. Star Service, Wapakoneta, Ohio.

OWN Mirror shop. Resilver mirrors. Glass sign making. Electroplating. Supply prices. John Sprinkle, V60, Marion, Indiana.

BRONZED Baby shoe mountings and supplies. All metal bronze bookends, picture frames, ash trays, etc. Onyx ash trays, desk sets, plaques. Hardening solution, 30-amp. plating rectifiers with powerstat control, \$85.00. Geared motors for agitation \$20.00. Lead lined tanks. Write for list. Hollywood Bronze Supply, 1770 N. Vermont, Hollywood 27, Calif.

MAKE Money making new greaseless doughnuts at home on electric machine. Wholesale to grocers, drug stores, cafes, hamburger shops. Send for free recipes and plans. M. Ray Company, 3605 South 15 Ave., Minneapolis 7, Minnesota.

MAKE Liquid marble, artificial marble flooring, flexible molds, statuary, art goods, novelties. Literature free. Kemico, Park Ridge 50, Ill.

GET Hundreds money making deals, business ideas, plans and manufacturing. Amazing folio free. Austin Mail Service, 5538 Lexington, Chicago, Illinois.

QUICK Money. "Repairing car batteries." At home! Easy tool Batteryman, Grand Junction, Colorado.

WANTED Unused U. S. postage stamps, small discount. Advance Stamp Company, 24 East 23rd Street, New York.

MAKE And sell candy professionally. Inexpensive to start. Information free. Box 670, Kissimmee, Florida.

POPCORN Machines. Potato chip outfits. Long Eakins Company, 4860 Hi Street, Springfield 95, Ohio.

READ "Advance"—The voice of mail order. Offers money-making opportunities, sources of supply, personal guidance, etc. Issued monthly. Sample copy 25c. Yearly subscription \$2.00. American Mail Trade Association, 313 East 21st Street, Suite 450, New York 19, N. Y.

\$46 FROM Square foot plywood. Jigsaw necessary. Write, Woodarts, X-33, Bridgewater, Mass.

OPERATE Profitable mail order business. Write Walter Service, 4159-A East 112th, Cleveland 5, Ohio.

RECAST Old batteries into new. Latest achievements. Battery Laboratories, Minneapolis.

RE-NEW Leather and leatherette—Make cloth into imitation leather with plastic discovery called Leather-New. Opportunity to make real profits taking care of sales resulting from national advertising. Write for free sample of Leather-New covered material and complete deal. 4723A Troost, Kansas City, Missouri.

COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National Potteries Company, Grand Rapids, Minnesota.

START Mailorder bookshop—Everything furnished. 25c brings booklet, samples, exciting ideas. General Publications, Ossining, N. Y.

SPECIALTY Manufacturing, the big money business that can be operated anywhere, start on a very small capital; we supply dependable formulas and complete instructions; get interesting free booklet, "Money-making Opportunities in Specialty Manufacturing." Howard Robinson, Ph.C., 1300-A South Ohio Street, Sedalia, Mo.

\$25 WEEKLY Working two hours daily. No canvassing. No manufacturing. Lycke, Box 2471, Cleveland 12, Ohio.

137 WAYS To make money, in home or office, business of your own. Full particulars free. Elite Co., 220 Grand St., New York 13.

BRUSH Plating outfits connect to a battery. No tanks necessary. Good paying business at home plating autoparts, bathroom fixtures, bicycles, reflectors, silvering mirrors. No shop or experience required. Outfits furnished. Free booklet. Gunmetal Co., Ave. H, Decatur, Ill.

WOULD You pay 3%—first \$350 made? Color-illustrated book "505 Odd, Successful Enterprises" free! Some offer occasional "day off." Work home. Expect something odd! Pacific, Oceanside, Calif.

MAILING Postcards selling repeat merchandise is profitable. Everything supplied. Details free. Gordan Publishers, Box 23, Pawtucket, R. I.

CO-PUBLISH And advertise in The Central Mail Advertiser. Sample copy for stamp. Low rates. Large circulation. Bagby Printing Co., Georgetown, Ohio.

MAIL Order opportunities. Full or spare time. Hundreds of chances. No charge. Postal brings copy. Blackstone Press, Somerville, New Jersey.

BRONZING Baby shoes is big business. Start your own business for \$3.95. All materials furnished. Metaloids, Box 2095, Wichita, Kansas.

BUILD To financial independence today. Sell office supplies by mail. Glenn Snyder, 5-B Spring, Beachwood, New Jersey.

START Home plaster novelty business. Amazing course tells how. Literature free. Kemo-Courses, Dept. A, 4862, Catalpa, Chicago 30, Ill.

MAKE Rubber stamps. Metalize baby shoes, silver mirrors, make plaster novelties. Catalogue of "20 Ideas" free. Universal, Box 1076-A, Peoria, Ill.

INCOME From local information. No selling. Neher Co., LaVerne, Calif.

HOME Business, bronzing baby shoes. Costs you 3c. You get \$3.00. Sample bronzing powder and mail order plan, \$1.00. Barrett Bronzing, Jacobsburg, Ohio.

MAKE Strange, durable plastic 1c pound. Makes charming floors, walls, mantels, roofs. 101 uses. Build better—far less. Bays Laboratory, Oklahoma City 9.

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1948 CARD Guide, sales plans, better, quicker, cheaper results. Small capital. Guide \$1. Information stamp. Matsonian, No. Grafton, Mass.

HAVE You seen this formula advertised before? Send \$1.00 cash for deodorant block formula. Simple manufacturing methods revealed, supply sources furnished. Better Deodorants, 1222A Melville, Vancouver, Canada.

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FREE Offer. Income for life plan. Bowen's System, 317 American Bank Building, Portland 5, Oregon.

HALF Million articles wholesale. Directory 25c, Publishers, 3006-P9 Williams, Detroit 16.

MAKE Money at home like I do! Write immediately. Duffy, Covington, Ky.

METAL. Onyx, plastic mountings for bronzed baby shoes, 20 styles. Hardening solution. Wholesale. Box 2095, Wichita, Kansas.

LIQUID Marble—Colorful, glossy! Molded, brushed, sprayed! Cast novelties, statuary, colored tiles. Flexible molds. Composition floors. Particulars free. Marbletizing Service, Edwardsville, Illinois.

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OWN—Operate ball gum, nut, cigarette vending machines. Amazing profits, no selling. Write for free details. Cameo Vending, Dept. P, 432 West 42nd, New York.

ENJOY Life. Learn waterproofing business. Others making thousands. Needed everywhere. Proof free. Bryan, Box 702, Cincinnati 1, Ohio.

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EARN \$200 Weekly installing new amazing "Styron" plastic wall tile in homes, offices. Easily applied. Tile your own kitchen, bathroom, too. Instructions, everything furnished. Literature free. U. S. Tile Co., 30 W. Washington St., Chicago 2, Ill.

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50 BUSINESSES You can start with \$10 and make \$10 per week! Complete—detailed! Copy, \$1.00. Literature free. Carey, 25-P, Waverly Place, Melrose 76, Mass.

BIG Money installing Aeroglass. Eliminates storm windows, frost, ice. Blue, Excelsior, Minn.

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LATEX For flexible molds, also rubber compounds for casting rubber objects. Lowest prices. Major Chemical Co., 131 Inman St., Cambridge 39, Mass.

START Your own photographic supply business on small capital. Sell nationally-advertised cameras, projectors, darkroom needs, accessories. Easy sales, big profits. Free details, prices. Peace Products Co., Dept. 23-L, 152 West 42nd St., New York City.

BE A used car dealer. Guaranteed plan \$1. Smith, 17A Rockland, Yonkers, N. Y.

RUBBER Molds, natural liquid rubber, flock filler (for making sectional molds), statuary plasters, felt finishes for novelties. Catalog and "Plastercraft" course free. Blue Rapids Supply, Blue Rapids, Kansas.

METALLIZE Baby shoes. Excellent profits. New system assures success. Free details. Treasures Forever, 89 Henry Ave., Lynn, Mass.

UNPAINTED Figurines, plaques, bookends, ashtrays, novelties, rubber molds, liquid rubber, casting and painting supplies. List free. Oman, 842 Broadway, St. Paul 1, Minn.

WAR Surplus without bidding. New products. Closeouts. Sacrifice offers. Advance information each week. Subscribe to Surplus Reporter. Business men, rush name for free sample copies. Write: Surplus Reporter, 223 West Main, Tipp City 2, Ohio.

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VARIETY Stores are profitable. I help you start. Fred Carpenter, Hamlin, Texas.

LIQUID Marble—Make in any color. Soundproof plastic flooring. Flexible molds. Cast novelties, plaques, statuary. Big money, your own business. Catalog free. Write, Bing Products, 88-A9A Broad Street, Boston 10, Mass.

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GET It for them wholesale. Be community buyer nationally advertised utility merchandise, radios, appliances, etc. Savings to 40%. Start spare, full time. This pleasant easy work can earn \$5000 year. Free information. Cox, 12 Foss, Saugus 10, Massachusetts.

\$250.00 MONTHLY. Raising Angora rabbits. Multiply fast. Wool brings \$9.00 pound. Plenty cash markets. Particulars free. White's Rabbitry, Dept. P, Newark, Ohio.

SELL By mail! Learn how! Join Mail Selling Opportunities Club! Details free! B. Wehner, Box 142-A, Roxbury 19, Mass.

MAKE Your own gold, silver, metallic, sign letters for store windows, etc. Samples, literature free. Art Enterprises, Box 352, New Westminster, British Columbia, Canada.

WHERE To buy at wholesale 100,000 articles. Free list. Maywoode, 1133 Broadway, New York.

PRESIDENTIAL Campaign advertising specialty, hot, profitable seller. Ace, Brentwood, Maryland.

ALL Kinds American, Swiss watches, new and used; retail \$3.65-\$345.00; profit 33 1/3% up; show our catalogue, get orders. Brookings, B-AJ1975, Little Rock, Ark.

YOU Make them. We sell them! New liquid plastic makes many items! Terrific demand! Earn minimum of \$50.00 per week at home. No experience or machinery required. We supply raw materials and instruction. Write Travaco Laboratories, P.O. Box 1893, Boston 5, Mass.

\$10.00-\$20.00 WEEKLY. Sparetime. Amazing opportunity. Free literature. Teepee Co., Cleveland 3, Ohio.

HOME Mail order business operated profitably on small capital. Details free. Webster, Lock Box 1292, Chicago 90, Ill.

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START Real Estate business. America's finest profession spare time. Details free. Educational Book Co., 2907 Berwick Ave., Baltimore 14, Md.

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SELL Watches, booklet free. Jewelbox, W-1455 Broadway, New York City.

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ANALYZE Handwriting for profit! Complete outfit \$1.00. Graphologists, POB-971, Philadelphia.

TESTED Money making plans. Free details. James Carter, Rocky Mount, Virginia.

THOUSANDS Articles wholesale. "Supply Source Directory" 10c. Ideal Service, Park Ridge 40, Illinois.

PRIZE Contest bulletin gives various contests now operating, and valuable hints. 3c stamp. National Contest Bulletin, Box 2685P, Miami, Florida.

WIN Contest money. General Contest Magazine gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609 1/2 East 5th, Duluth, Minn.

WOULD You pay 3%—first \$350 made? Color-illustrated book "505 Old Successful Enterprises" free! Proven! Work at home, office. Expect something odd! Pacific, Oceanside, Calif.

PUBLISH Your own magazine. Hand-some 52 page format, well edited, illustrated. Cost low as \$1.00 month. Brings you prestige, profits. 25c brings sample, details. National Ord. Nebr.

"WATERLESS Hand Cleaner." Make, sell. No machinery. Build profitable business. Complete formula \$1.00. Ideal Service, Park Ridge 2, Illinois.

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FREE Booklet "How To Raise Worms For Bait." Tells how to propagate, package, sell. Send postcard. El Sobrante Earthworm Farm, 749-A Rincon Road, El Sobrante, California.

LOOK Here! Wanted—Men to start in business on our capital. Sell some 200 farm-home products. Thousands our dealers now make quick sales, big profits. For particulars write Rawleigh's, Dept. I-192A-PPM, Freeport, Ill.

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SERIGRAPH Printing. Easy, profitable. Samples free. Joseph Bolger, 148 Concord, River Edge, N. J.

FAST Sales, cuts food cost. Nets \$9 a case. Sell 6 daily. Exclusive terr. Jeld, Ltd., Burbank, Calif.

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METALLIZE Baby shoes. Further information 3c stamp. Metal Crafts, Box 125-R5, Tampa 4, Florida.

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CONCRETE Block molds, 8x16x4 \$8.70 others. Literature free. Lehnert, Norwood 2, N. J.

START Your own business! Big money manufacturing novelties, plaques, statuary. Free catalog. Write Bing Products, 88-A9B Broad Street, Boston 10, Mass.

EARN Extra money. Easy pleasant work. Write: Reminder, Thurmont, Maryland.

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BARGAINS In plastics. Lucite, Plexiglas, Catalin. Many colors and sizes. Details free. George Plastics, 6938A George St., Chicago 34, Ill.

RENEW Leather and leatherette—Make cloth into imitation leather with plastic discovery called Leather-New. Opportunity to make real profits taking care of sales resulting from national advertising. Write for free sample of Leather-New covered material and complete deal. 4723B Troost, Kansas City, Missouri.

SEPTEMBER Special. Supply kit including powdered and liquid, carving and tinting dyes. Luminous powder and cement. \$1.75 postpaid. Lucite, Plexiglas, sheets, rods, tubes, findings. Free catalogue. Craft Plastics, Somerville 1, New Jersey.

PLASTIC Materials and supplies for your hobby or business. Catalog and internal carving instructions free. Art Plastics of Calif., 8125 East 14th Street, Oakland 3, Calif.

LUCITE, Plexiglas. Any size sheets. Cost square foot (12"x12") 1/16" 96c; 1/8" \$1.25; 3/16" \$1.52; 1/4" \$1.80; 5/16" \$2.23. Include 10% postage. Almac Plastics, 1150 Broadway, New York 1, N. Y.

AMAZING Liquid plastic pours cold, hardens in half hour. Clear, colors. Expensive equipment unnecessary. Embed photographs, coins, flowers, seashells. Complete kit only \$3.25. Kristalon Plastics, Dept. A-9, Box 29, Wilmette, Ill.

CELLULOID—New, beautiful selection. Mottles, opaques, onyx, pearls. Used by ring makers everywhere. One pound assortment—pieces approximately 30 sq. in. each. Price \$1.00. Please add 10c for postage. Craft Service, 337 University Avenue, Rochester 7, New York.

AGENTS Make big money selling plastic tablecloths. U. S. patented plastic aprons, magic combination of purse and shopping bag. Also other items. Sells on sight. Samples free. Schneider Products Co., 83 Atlantic Ave., Revere, Mass.

PERSONALIZE Plastic gifts, clock faces, etc., with 15¢ plastic letters and numbers. Samples 10c. A. H. Dreher, 2332 Brockway, Cleveland 18, Ohio.

PLEXIGLAS, Lucite, Acetate, sheets, rods, tubes, jewelry findings, craft supplies, over 1700 items, 25c which brings catalog, internal carving folder, information on fabricating plastics, deducted from first order. Plastic Parts, Dept. H-2096, 1157 S. Kingshighway, St. Louis, Mo.

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YOU Name it. We'll supply formulas. Air mail. \$1.00. Brown, 9111 Hoyne, Chicago 20.

21 MONEYMAKING Candy apple, popcorn formulas. Send \$1.00 m.o. We can supply equipment for starting very profitable popcorn, candy floss business at little cost. Concession Supply, Dept. A, Sta. "B," Toledo, Ohio.

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NEW Laboratory supply catalog of chemicals and apparatus. Contains many thousands of items with illustrations. Send 25c. Standard Science Supply Company, 1232 N. Paulina St., Chicago 22, Illinois.

FREE Catalog: Chemistry, mineralogy, physics, biology. Tracey Laboratories, Evanston, Illinois.

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LABORATORY Chemicals, apparatus, books. Catalog 10c. Felscher's Laboratories, Everett 49, Mass.

EDISON'S Home laboratory made him famous. Start yours today. Catalogue, chemicals and apparatus 15c. Microscopic stain catalogue 30c. Both for 25c. National Scientific Company, 2204 North Ave., Chicago 47, Ill.

HELP WANTED

MAKE Big profits in little spare time. Show friends deluxe name-imprinted designs of breath-taking beauty. 25 for \$1.50; 25 for \$1.95 and 25 for \$2.95. Gorgeous Christmas and everyday card assortments. Write for free samples. Western Art Studios, 257 S. Spring St., Los Angeles, Calif.

AGENTS Wanted—Quality paint manufacturer seeks representation on commission basis. Time and territory your own. Sell to the farm trade, factories, home owners, etc. Competitive prices. Scott-Leed Paint & Varnish Co., 2948 E. 81st, Cleveland, Ohio.

BOYS Wanted. Over \$50 week! Sell name plates for front doors. Write Dept. 7, National, 214 Summer, Boston, Mass.

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AGENTS. Salesmen. Fast seller; new; different. Every woman needs; waiting to buy. Mr. F. made \$304.20 in 3 days. Selling like wildfire. Sample furnished. Boulevard Art, 75-MA West VanBuren, Chicago.

FREE Nylons given if Kendex hosiery runs or snags! World's only women's hosiery sold with a written guarantee that amazes everybody. Mere words could not possibly express the almost unbelievable opportunity you now have to make money. Fantastic and "impossible" earnings now become a reality. Can you imagine a guarantee that replaces hosiery regardless if damage is due to use or abuse and regardless whether it is the fault of the hose or the wearer? Here is sales dynamite that will blast your earnings to the sky! Even if you never sold a thing in your life, three magic words: "guaranteed against everything" will open doors for you—will make women listen and will pour money in your pocket. Kendex stockings are not sold in stores, so you have no competition. Complete line includes beautiful sheer nylons; long wearing, durable service nylons; three different lengths; genuine outside nylons; latest shades; choice of full fashioned with seams or seamless; lowest priced rayons. Also separate complete line of men's hosiery including nylon, list, rayon, cotton, mixtures etc.; plain and fancy; long and short. Thousands of pairs shipped daily. No money or experience needed. Nothing to invest or risk. No samples to buy. Nothing to pay, now or later! Simply write orders. We deliver and collect. Liberal advance cash plus huge cash bonus. Write orders spare or full time; exclusively or as a side line. Become a manager and appoint others to sell for you with steady income on their sales! Complete money-making outfit, including salesbooks in color, samples cut from actual hose, instructions, order blanks etc. furnished free and prepaid. Rush name and address on postcard and start making money next week. Kendex Co., Babylon 167, New York.

BIG Money selling cast iron and aluminum cooking utensils direct to consumer, exclusive designs. Free illustrations. Jones Machine & Foundry Co., Chattanooga 2, Tenn.

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AGENTS Sweet smelling perfume novelties sell on sight. Gorgeous samples. Free particulars. Mission, 2326R West Pico, Los Angeles 6, Calif.

SELL Ultra-blue stock signs to stores. 1000 slogans, comedy, general, religious. "7x11" cost 6c, sells 35c. Make money. 15 samples ultra-blue signs "7x11" \$1.00 postpaid. Lowy, 8 West Broadway, Dept. 399, New York City 70.

BIG Bargains for big profits. Over 100 sensational wholesale values. Men's used suits \$2, pants 35c, topcoats \$1.25, overcoats \$2, shoes 30c. Experience unnecessary. Free catalog. Superior, 1250-A Jefferson, Chicago 7.

FREE Sample! Big profit opportunity with amazing Glow-in-the-Dark house numbers, switch plates, pictures, decals, religious articles. Represent large manufacturer. Madison Mills, 303 Fourth Avenue, New York 10, N. Y.

POSITIVELY New. On market only short time. Hundreds of virgin territories open. Retail \$1.50. Write for details. Sample \$1.00. Farrell Company, 1377 Galbraith, Cincinnati 31, Ohio.

MAKE More money direct from factory. Fibre brooms, floor dusters, patented wet mops. Aluminum mop wringers. Big profits. Write Burtz Fibre Broom Co., Columbia, Penna., Dept. A.

PLASTIC Christmas cards. Exclusive new plastic, sachet, panoramic and carols Christmas assortments. Five leading 21 card \$1.00 feature assortments. Six portfolios of personal cards. All this plus America's fastest imprint service. Free samples. Elmercraft Card Co., 5930 South Western, Chicago 36, Illinois.

AMAZING Profits. \$25.00 for selling 50 \$1.00 deluxe Xmas boxes. Embossed 50 and 25 for \$1.00, name imprinted. Free samples. Ed-Brite, Dept. 12, 435 North Terrace Avenue, Mt. Vernon, New York.

\$25 YOURS For selling only fifty \$1.00 boxes, new exclusive different Christmas and all-occasion cards; also extra cash bonuses. Send for Champion Cheerio 21-card box on approval. Free samples 6 new personal groups and stationery. Write today. Dept. 27, Pen-Brush, 154 Nassau St., New York 7.

MAGIC Cleaner—Laundry soap deal. Hotter than a firecracker. Big profits. Sample free. Bestco, 4642 No. Central, Chicago.

SELL The famous \$3 "Fire-Killer" extinguisher with bracket, wholesale or direct; exclusive territory. "Fire-Killer," Syracuse 1, N. Y.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

MAKE More money selling personal initialed individualized belts, buckles, cap badges, tie holders, name plates. 2,000 emblems to choose. Big profits, whole or part time. Write today; special outfit offer. Hookfast Specialties, Box 1425, Dept. 6, Providence, Rhode Island.

FREE Water and our concentrates, makes flavors, lotions, shampoos, 72 products, labels, bottles furnished. Qualco, E-20030 Russell, Detroit.

INFORMATION—Wholesale supply sources. Money-making plans. Increase your income! Write Reynard Service, Smithfield 3, Ohio.

GOLD Lacquered window sign letters. Large sizes penny each. New foils. Absolutely beautiful. Free samples. Atlas, 544 W. 79th, Chicago 20.

EXCELLENT Sideline for printing and advertising salesmen. Decalcomania name plates in small quantities. Great demand. Also, make money with our line of automobile initials and sign letters. Free samples. "Ralco" XL-Roxbury, Boston 19, Mass.

NEW Extra money plan. Make up to 100% profit; without experience; showing Christmas, Everyday Card assortments, wrappings, stationery, coasters. Unusual, attractive. Bonus. Special offers. Send for free samples 30 different name imprinted Christmas cards, 50 for \$1.00, 25 for \$1.00 and \$2.00, stationery, coasters. Christmas. Everyday assortments on approval. Thomas Terry Studios, 90 Union Ave., Westfield, Mass.

\$5.00 CASH Advance commission every sale. 38-piece "Lady Ann" silverplate table service. Guaranteed quality, value bring sales galore. Sells for only \$14.95, including tarnish-resistant chest. Bonus premiums. Write for free outfit. Dexter Silver Co., 303 Fifth Ave., Dept. PM-9, New York.

MAKE Money fast! Sell Christmas cards to friends, neighbors, others. Big variety etchings, religious, 50 for \$1.00. Wrappings, stationery. New \$1.25 line "Little Ones," flower box, plastic frosteds, Saints 'n' Sinners. Special offers; bonus. Fund raising opportunity for individuals, clubs, churches, schools. Mail postal today for feature 21 card \$1.00 Christmas assortment on approval. Hedenkamp, 343 Broadway, Dept. S-42, New York 13.

AT Last! Something new and sensational in Christmas cards. Gorgeous satin, velour designs never before offered. Amazing value! Gets orders fast. Name-imprinted Christmas cards, 50 for \$1 up. Big profits, 30 other assortments 60c to \$1. Imprinted stationery. Samples on approval. Puro Co., 2801 Locust, Dept. 840-L, St. Louis, Mo.

AMAZING Daily profits, steady repeat business selling famous Colt shoes direct. Exclusive features make selling easy. Experience unnecessary. Patented Footograph assures accurate fitting. Free selling outfit. Colt Shoes, 601-J5 Atlantic, Boston 10, Mass.

AGENTS—300% Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Letter Co., 438-B North Clark, Chicago.

EARN Big money year 'round. Be a one-person-department-store. Take orders for shirts, ties, hosiery, lingerie, household linens, etc. For information, Corporate Merchandisers, Dept. PM 6, 110 West 34 Street, New York City 1.

ENTIRELY New—Entirely different specialized men's shoe line. Advance commissions to \$2.50. Bonuses, personal discounts. Free selling kit, Concordian Shoes, M-1, West Concord, Mass.

AMAZING Offer—\$40 is yours for selling only 50 boxes, each containing 25 new, entirely different deluxe Christmas cards with or without name imprinted. Also 50 for \$1.00. Free samples. Other boxes on approval. Write today. It costs nothing to try. Cheerful Card Co., 413, White Plains, N. Y.

CHRISTMAS Cards! Jobbers' prices! Fifty different items from 18c to 38c per box. Gift wraps, seals, Christmas tree windows, books, letterheads. Illustrated catalog free! Fantus, 436 North Wells, Chicago.

SILVER Plating liquid—(NuSilver). Anyone can apply with cloth. Durable, guaranteed, genuine silver finish. Renews silverplated ware, articles, pieces. Silverplates brass, copper. Sales-distributors wanted, exclusive. NuProcess Products, Aurora, Illinois.

QUICK Cash. Sell friends wonder value name imprinted Christmas cards 50 for \$1.00 up to 25 for \$2.50. 43 sensational money makers. Up to 100% profit. Bonus. Special offers. Write for 9 free self-selling sample portfolios name imprinted Christmas cards and stationery. Rainbow Greeting Card Co., 38 East 1st St., Dept. 17-B, New York.

SCIENTIFIC Discovery Savol Waterless Hand Cleaner Creme removes stains, paint, ink, etc. Contains Lanolin. Sample pound 50c, postpaid. Free particulars. Valtex Company, Rochester 7, New York.

OUR Salesmen earning \$150 weekly. Sell Diamolite ring line house to house on credit. Commission \$2.00 on \$6.95 ladies' rings, \$3.00 on \$12.95 man's ring. Acme Mercantile, 115 Union St., Nashville, Tenn.

EASY Profits to 100%. Sell friends superior value 21-card \$1.00 Christmas assortment, 50 for \$1.00 personals, everyday, gift wrappings, stationery. Experience unnecessary. Request 1948's newest super deluxe Christmas assortment and name imprinted Christmas card samples on approval. Holiday Card Co., 463 Congress St., Dept. MR, Portland, Maine.

SELL Garages, filling stations guaranteed tire patch. Protected territory. Economy Rubber Co., Riverdale Station, Box 552-E, Dayton 5, Ohio.

\$1 STARTS You in business. Sell lined ties, 100% wool interlining. Costs you only \$7 per dozen, you make \$5.00 dozen. Send \$1.00 for special introductory offer two ties. Catalog complete line free. Philip's Neckwear, 20 West 22nd St., Dept. K-27, New York 10.

BIG, Easy profits to 100% selling new, novel Christmas card, gift wrapping, panorama, Christmas carol assortments. Bonus. Special offers. Request free samples 50 for \$1.00. Personals, silver imprint line, name imprinted and floral stationery and feature Christmas samples on approval. New England Art Publishers, North Abington 248, Mass.

SELL Luxury perfumes for profits and repeats. Generous samples \$1.00 deductible first order. Edward Layson, 10-21 Joiner Street, St. Augustine, Florida.

BE Renewal headquarters for all magazines. Christmas gift sales starting now. Big profits. No experience. No capital needed. Free catalog tells how. Write: McGregor Magazine Agency, Dept. 12, Mount Morris, Illinois.

CHRISTMAS Cards. Earn \$3.00 an hour. Take orders galore from friends. America's fastest selling 21 Christmas folder assortment. Smart, distinctive! Costs 50c. Sells \$1. A complete line. Samples on approval. No investment. Sunshine Art, Dept. PM-8, 115 Fulton St., New York 8, N. Y.

MAKE Easy extra money. Sell Christmas cards. 9 beautiful lines. 25 for \$1 up. Name imprinted. Samples free. Cyphers Card Company, 74 W. Huron St., Buffalo, N. Y.

SOLVE Your money problems. Sell friends 50 and 25 for \$1.00, 25 for \$1.95 name imprinted Christmas cards—free sample portfolios. 32 different boxes. Profits to 100%. Bonus. Feature Christmas, all-occasion assortments on approval. Special offers. Write Pilgrim Greeting Card Co., 111 Summer, Dept. AH-1, Boston, Mass.

SELL Gold embossed monogram stationery. Sample free. Dunbars, Sanford, Fla.

AGENTS To sell a fast moving item. Acclaimed by users throughout the country. Exclusive territories open for honest, proven salesmen. Big profits to aggressive agents. If you can sell, then this is your opportunity. Write today. Speed Waxed Company, 4451 Elston Ave., Chicago 30, Illinois.

SELL Mexican leather bird pictures. Hand-made of real feathers. Sample 25c. Importer, C. Staff, 14960 Evanston, Detroit 24, Michigan.

BIG Money maker! Waterproof table covers, food protectors. Other terrific sellers. Postal brings free selling equipment. Star, 261M Fifth Ave., New York 18.

AGENTS—Sell Cover-Tite for garbage cans \$1.49. Windproof, dogproof. Sample 89c. Western Welding Mfg. Co., 4439 W. State St., Milwaukee 8, Wis.

MARVELOUS New needle threader. Wonderful invention. Eagerly sought by housewives, sewing clubs and elderly people with poor eyesight. Even blind person can thread needle instantly. \$1.00 profit on each sale. Be first in your locality. Send \$2.00 for sample. New England Metal Products Co., Oakville, Conn.

MAKE \$20 A day selling big value stay-polished solid brass name plates for doors; other easy sellers. Write today. Hub-stamp, 357-A Congress, Boston, Mass.

CHRISTMAS Cards 50 for \$1. Other series of 25 from \$1-\$2.50. Also box assortments. Free sample albums. Commission. Bonus. Richar Greetings, 16 E. 18th, New York 3.

START Your own business on our capital. Always your own boss. Hundreds average \$6,000 to \$25,000 annual sales year after year. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary to start. Wonderful opportunity to own pleasant, profitable business backed by world-wide industry. Write Rawleigh's, Dept. T-U-PPM, Freeport, Ill.

100% PROFIT. No investment—Handle quality Fotostamps. Amazing glossy photographs, gummed stamp form. Business year round. Free samples, particulars. American Foto Stamp Co., 103 East 125th St., Dept. PM 9, New York 35.

POCKET Pal: replaces knives. New, safe, beautiful. Always razor sharp. 50c seller. 321% profit. \$15.00 or more daily. Agents, salesmen, distributors. Sample 25c. Nelson Mfg. Co., 222 W. Kellogg, St. Paul 2, Minn.

CALL On friends with sensational Christmas cards in handy assortments. Sell for \$1.00. Profit up to 50c. Also popular-priced personal Christmas cards, everyday assortments, stationery, imported napkins. Samples on approval. Wallace Brown, Dept. J-4, New York 10, N. Y.

A DRESS Yours with every 3 you order for yourself and family. Amazing new bonus plan. Everything free. Harford Frocks, Dept. S-9128, Cincinnati, Ohio.

GREETING Cards, stationery, gift wrappings. Personalized napkins, book matches, playing cards. 4154g Fifth Street, Philadelphia 40, Penna.

SHINE Shoes without polish. New invention. Lightning seller. Shoes gleam like mirror. Samples sent on trial. Kristee 126, Akron, Ohio.

FAST Sales, cuts food cost. Nets \$5 a case. Sell 6 daily. Exclusive terr. Jeld, Ltd., Burbank, Calif.

MORE Money in closeouts. Pricelist free. Metro, 60 South Street, Boston 11, Mass.

GREETING Card agents! Double your income with profitable sidelines. Write today! Mosher's, Vineyard Haven, Mass.

FACTORY Agents. Sell dealers. Power mowers, engines. Farm Products, M-2009, Excelsior Springs, Mo.

"BROADWAY Ballyhoo"—Lyrics, wit, humor publication. Distributors wanted. \$30.00 thousand. Sample 10c. Noveline Enterprises, 1451 Broadway, New York.

SELL Merchandise. Big profits. 3519 32nd Street, Union City, N. J.

EVERY Housewife a prospect for automatic Speedi-Waxer. Send for details two big profit sales plans. Darby Corporation, Dept. 8M, 241 Centre St., New York 13, N. Y.

FINE Opportunity to have pleasant outside business of your own. Supply every home with food products, flavors, washing preparations, and scores of other daily used items. Work part or full time. Many dealers with us for from five to twenty years. Exclusive territory assigned. No age limit. Selling experience unnecessary. Don't delay. Every day counts. Write now for details. C. I. Tognstad Co., Dept. PM-9, Kokomo, Ind.

CHRISTMAS Cards. Earn \$5.00 with every ten 21 card \$1.00 boxes you sell. Also new plastic cards, personalized cards and stationery, note paper and wrappings. Send for samples today. Howard P. Ellis, Dept. PM-10, Pitman, N. J.

SELL Cosmetics. Attractive containers. Ladien Grehard, D6, 913 Main, Kansas City 6, Missouri.

DISTRIBUTE Polishes, waxes, etc. McBride Products, D7, 913 Main, Kansas City 6, Missouri.

DIRECT From factory. Make \$100 weekly selling watches. Advertised brands with guarantee. Free catalogue. Ergim Watch, 833 Columbus Ave., New York.

EASY Cash yours; steady, quick. Sell friends quality Nylon hosiery, lingerie, blouses. Free displays. Complete line greeting cards. Leader Christmas assortment on approval. Special outfit offers. Wear Wright Company, 1709 Arch St., Dept. B, Philadelphia, Penna.

BUY Thousands of nationally advertised products direct from manufacturers. Write for "Buy Direct And Save." Consumers Ass'n., 287-A Lebanon Ave., Mt. Lebanon, Penna.

SCHOOL Seniors—Earn 40% commission selling classmates America's most beautiful graduation name cards. Largest selection. Outsell all others. Free sample kit. Printcraft, Dept. M, 1425 E. Elm St., Scranton 5, Penna.

300% PROFIT Selling "Famous-Arts" Christmas cards. Boxed assortments. Sensational value, quick easy sales. Start earning at once. Send \$1.35 (refundable) for 3 assorted boxes; brings \$5.25; or rush name for free money-making plans. Elmore Smith Co., 362-P West 52nd St., New York 19, N. Y.

NYLONS—Genuine DuPont. Highest quality. Lowest prices. Sims, Warwick, New York.

SPECTACULAR Guarantees, popular prices, make selling easy. Biggest steady repeat profits selling Colt's famous men's, women's guaranteed shoes, hosiery. Experience unnecessary. Free selling outfit. Colt Shoes, 601-J9 Atlantic, Boston 10, Mass.

SCHOOL Seniors! Your postal will bring our wonder, Kwick-Sell Cardalog of popular graduation name cards. Biggest profits! Only firm giving free souvenir chest and card case. Don't miss out! Hurry that postal! Craftcards, Box 235 (L), Pittsburgh 30, Pennsylvania.

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BRAND New! Revolutionary products! Salesmen make \$10,000 yearly selling one complete lighting line. "Neo-Glo" fluorescent changeable message sign replacing neon. "All-Lite" table lamp using upright fluorescent tube, spectacular "Circline" fixtures using circular tube. Verticals, dual-rays, pin-up lamps, a complete line of fluorescent and incandescent fixtures covering every commercial, industrial, residential need. A triple sales plan insures your success whether you choose selling dealers, direct, straight commission or distributorship on our capital. Get set now with our growing progressive organization. To get you started, we will send a beautifully illustrated catalog showing over 200 profitable, sales-tested styles and models. Order blanks, sales helps, everything needed to start at once included. It costs you nothing. Rush name quickly, today, and start making real money. Rose Company, 530-PP South Franklin, Chicago, Illinois.

BIG Money quickly and easily taking orders for complete line personalized initialed buckles, belts, cap badges, 2,000 emblems. Fast repeats. Write today. Hook-Fast Company, Box 480-PM, Roanoke, Virginia.

JOBS Open in selling! Send name, address for free copy Opportunity Magazine, listing hundreds of companies who need men now, full or spare time. Experience not essential. Opportunity, 28 E. Jackson, Dept. 17, Chicago 4, Ill.

BIG Money taking orders. Shirts, ties, coats, pants, jackets, sweaters, shoes, uniforms, etc. Sales equipment free. Experience unnecessary. Nimrod, 4922-AN Lincoln, Chicago.

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SILVER Plating Liquid—(NuSilver). Anyone can apply with cloth. Durable, guaranteed, genuine silver finish. Renews silverplated ware, articles, pieces. Silver-plates brass, copper. Sales-distributors wanted, exclusive. NuProcess Products, Aurora, Illinois.

TWISTEE Animal balloons, twelve balloon package, cellophane 25c. Novel rubber and plastic toys. Add to your line or sell exclusive. Ellswood's, La Junta, Colo.

ADVERTISING Book matches—Cash on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. M-98, 7530 Greenwood, Chicago.

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MAKE \$15.00 To \$25.00 per day. Joe Louis' and Marva Louis' (his wife) toilet articles, cosmetics and other products for men and women are sensational. White people like them; colored people buy on sight. Perfumes, powders, pomades, creams, brown creams, flavors, remedies, and many other fast sellers are our features. \$3.95 buys \$10.00 (23 items) retail deal—send \$1.00, pay postman balance. Be first in your community to offer this new line and you will be happy. Joe Louis Products Company, 6 E. Garfield Blvd., Dept. PM-9, Chicago 15, Illinois.

SALESMEN. Earn \$100.00 weekly, selling only six pair shoes daily. Commission and bonus. Wide variety for men, women, children. No investment. Experience unnecessary. Tanners Shoes, 300, Boston, Mass.

I'LL Put a "shoe store business" in your pocket! Nation's leader trains you to make big money! Fit men, women. Free sample outfit; write today! Consolidated Shoe System, Dept. S-138, Chippewa Falls, Wis.

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SELL Delicious candies, nuts, gum. Immediate delivery. Write Casterline, 2031-PL Sunnyside, Chicago 25, Illinois.

FAST Sales, cuts food cost. Nets \$9 a case. Sell 6 daily. Exclusive terr. Jeld, Ltd., Burbank, Calif.

PLASTIC Advertising specialties sales kit \$1.00 refundable. Phil Brautigam, P.O. Box 5201, Portland, Oregon.

SALESPeople. Crew managers, sell leading plastic line; tablecloths, aprons, etc. Postal brings free details. No investment necessary. Mark Steele, 58 Walker St., New York.

BIG Money selling fluorescent lighting fixtures for manufacturer in your territory. Complete line. Latest designs. Low prices. Free outfit. National Lighting, PM-4221 Harrison, Chicago.

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INDUSTRIAL Oakland, Information \$1. Remailing 25c. Marcel Adams, Fairmont, San Leandro, Calif.

DENVER Postmark! 5 postcards \$1.00. Letters 25c. Toms, 725 Logan, Denver 3.

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ADS Placed in out of town newspapers and magazines. Low rates. Catalogue free. Ideas that pay. Baker Advertising Agency. Successors Ankrum Agency, 189 W. Madison, Chicago 2.

MAILING Lists, certified, productive, inexpensive, \$5.00 1000. Homeworkers, agents, buyers, etc. Write Dixie Service, King, N. C.

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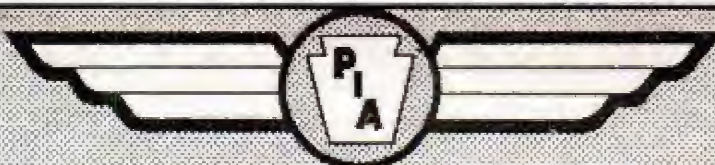
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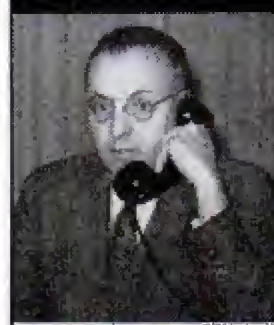
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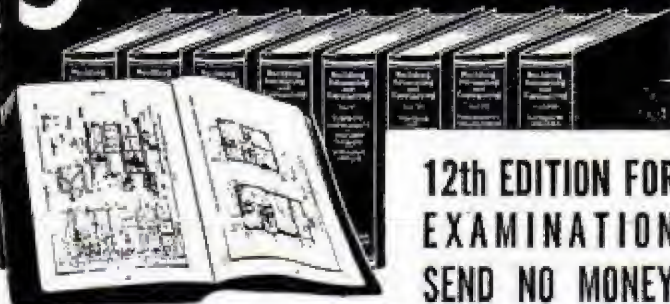
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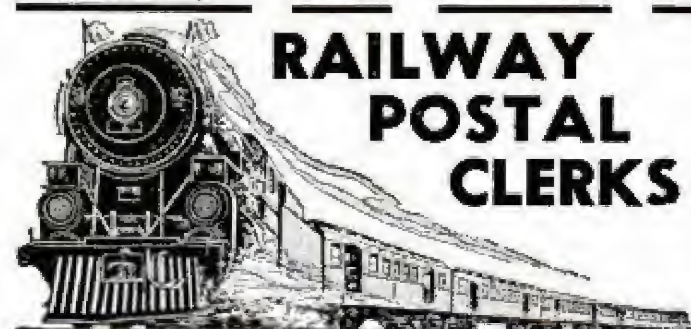
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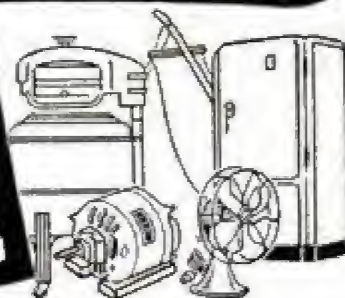
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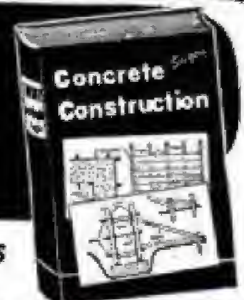
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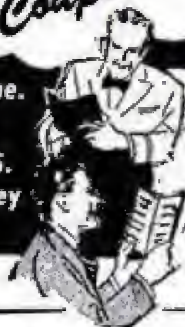
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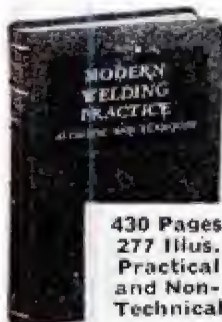
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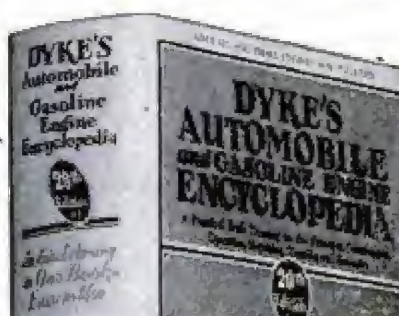
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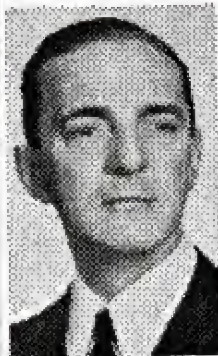
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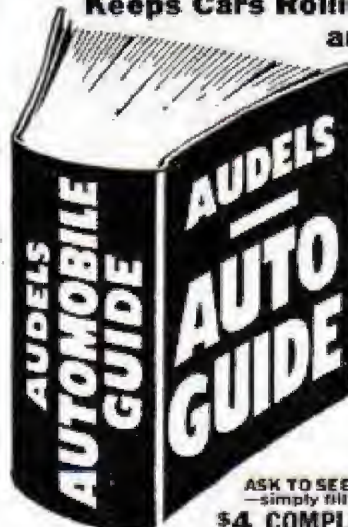
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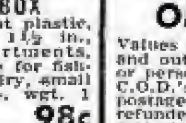


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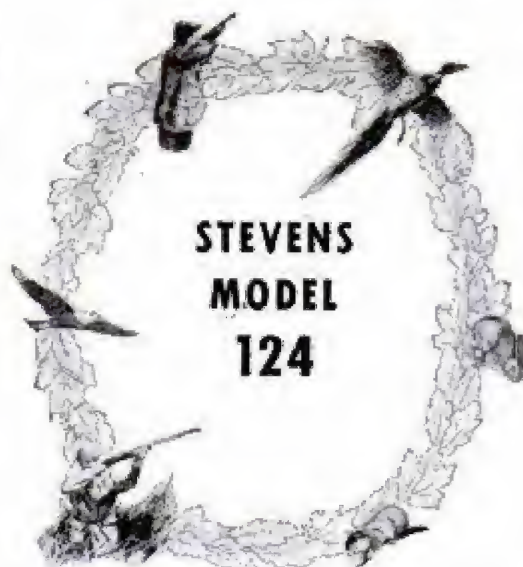
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SAFETY — Push button type at forward end of trigger guard.

BARREL — 28" — modified or full choke. Special alloy gun barrel steel. 12 gauge — chambered for 2 3/4" shells.

RECEIVER — Polished and blued, solid frame, side ejection. Tubular magazine — with one shell in chamber — making 3-shot repeater.

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In Minneapolis 500 men are serving as research guinea pigs in experiments to find why a man's ticker stops ticking

MASS ATTACK on Heart Disease

By Clifford B. Hicks

RECENTLY a Minneapolis executive in his forties approached a life insurance company for a big policy—\$250,000. Because this is a large amount of money to gamble on a man's life, the insurance company called in top-flight physicians who examined the prospect from head to toe. They gave every organ of his body a clean bill of health.

Seven days after the policy was issued the executive was dead of a heart attack.

Even the finest doctors had no way of knowing that this man was subject to cardiovascular disease—the medical term for disorders of the heart and blood ves-

sels. Medical science, despite its magic strides in other fields, has uncovered very little basic knowledge of who will be subject to these disorders; why heart disease attacks some persons and leaves others alone, and what can be done to warn prospective victims of their fate.

In Minneapolis 500 men are starting their second year of service as guinea pigs in a mass experiment to lay bare some of the facts on heart disease. It's a project that will last at least five years, may carry over for 10, and ideally should be run as a "last man's club" until every one of the 500 volunteers is dead. The goal is to find



Sound instrument on volunteer's chest records pulse starting from his heart. Photoelectric cell, shown at left, detects pulse when it reaches the big toe. Time interval shows elasticity of blood vessels



out why a man's ticker stops ticking and why his blood vessels grow hard.

The man who conceived this mass approach is 44-year-old Dr. Ancel Keys, director of the University of Minnesota's Physiological Hygiene Laboratory. Doctor Keys' last piece of wizardry was a dramatic wartime study of starving human beings. A large group of conscientious objectors underwent severe starvation while he watched the effects. The results of these experiments are being applied today to sustain life in famine areas.

Doctor Keys feels that cardiovascular diseases are the major threat to our national health. He points out that heart disease has been the nation's number-one killer for 25 years. It causes more fatalities in the United States than the next five leading causes of death—including ac-

Caliper-type instrument measures the amount of fatty tissue beneath the volunteer's skin to help in analyzing the effect of underweight or overweight on diseases of heart and blood vessels. Weight on scales is no true indication of the amount of fat on the volunteer's body

St. Paul Pioneer Press photo



cidents—combined. Cardiovascular diseases cause as much disability as cancer, tumors, nervous and mental diseases.

Yet medical science has only assumptions and theories as a foundation for its fight against cardiovascular disease. No one knows for sure what causes high blood pressure or why blood vessels grow hard.

Doctor Keys points out that relatively little basic research on heart disease is under way, despite its status as public enemy number one. He attributes this in large part to a lack of funds. For every death from infantile paralysis, \$525 is spent annually on research in this country; for every death from cancer, \$2.13 goes into the lab, but for every heart disease fatality, only 17 cents is contributed for research and investigation.

In planning his attack on this sudden killer Doctor Keys ruled out a search for new methods of treating those who already have contracted the disease. He doesn't belittle such efforts, but claims that this type of research can only prevent a bad pumper from growing rapidly worse. The approach is limited. High blood pressure and heart disease seem incurable for the same reason an old car is incurable unless it has a new engine—and you can't buy a new engine for your body. Half the adults in the United States are being chased down a blind alley by this form of death. It's not a matter of whether they'll be caught, but how long until they are.

"The real problem lies in a comparison of two classmates," says Doctor Keys. "Both apparently have taken care of themselves. Yet one is hale and hearty at 80 and the other is picked off at the peak of his value, 30 years before. Why?"

Doctor Keys and his staff of experts in many medical fields cast about for a method of answering this question. They wanted to find out exactly why one man develops

heart disease and his classmate doesn't. The disease can't develop by chance. Therefore they conclude that there are definite factors in the way a man lives that must bring on the disorder.

A study of a man's life requires years of investigation. The team of scientists determined to cut this period as short as possible by choosing human guinea pigs who are in the prime of life at a period when heart disease is most likely to strike. By watching these men closely they might be able to put a finger directly on the cause of the disorder. They further decided that they would need three groups totaling

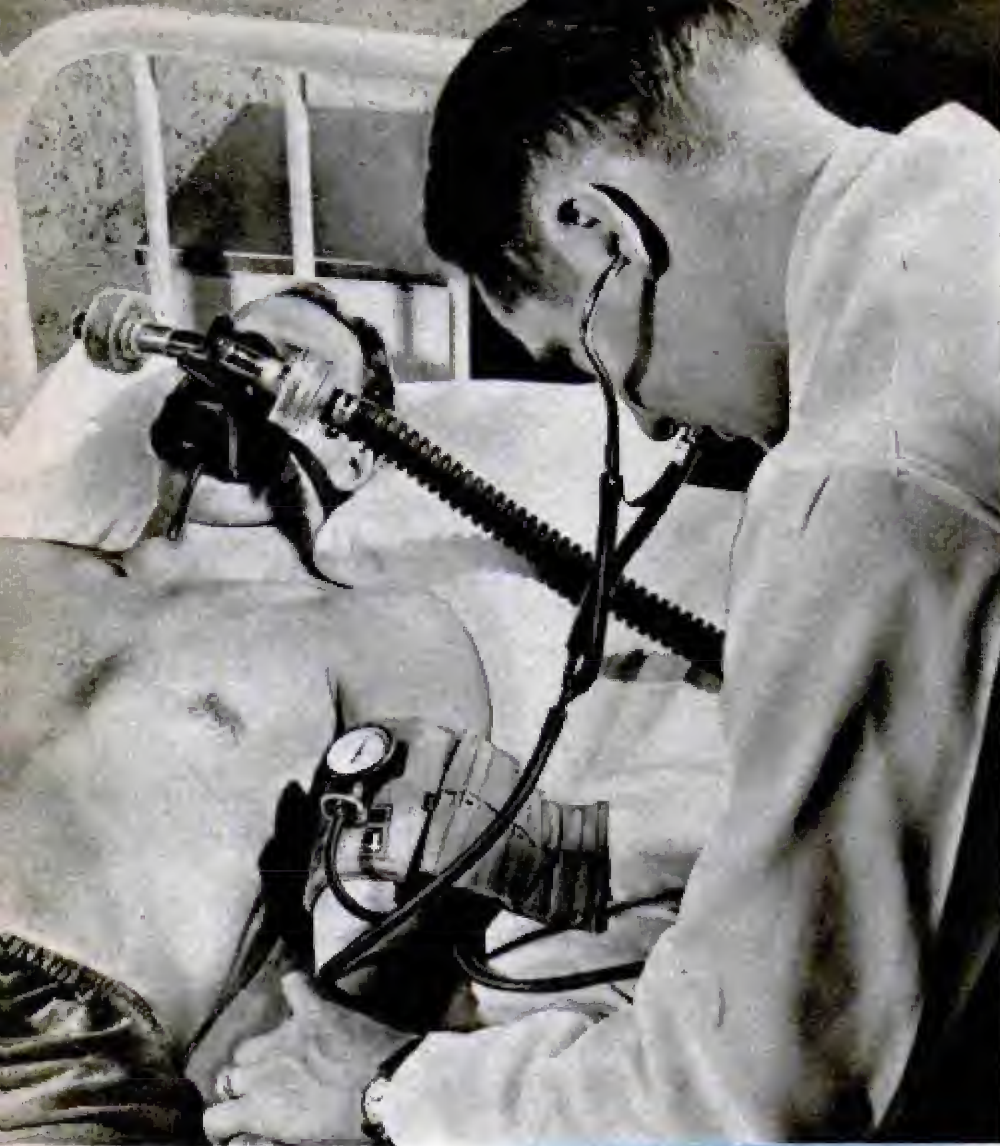


Minneapolis Tribune photos

By means of a continuous-exposure X-ray, one of the scientists measures the dimensions of heart when it is full and when it is empty of blood

Research assistant gives subject's blood a color test to measure the amount of cholesterol, a fatty substance absorbed from butter and eggs





Blood pressure soars when a subject breathes air rich in carbon dioxide. Too much variation means he is subject to high blood pressure

500 volunteers: The prime-of-life group between 45 and 54 years old; a group of young men that they could watch for early symptoms, and a small group of men who already had heart disease that they could use as a control group for comparisons.

Accordingly, Doctor Keys examined 180 college men for facts on the younger group. To get volunteers for the prime-of-life group he asked 25 Twin Cities business concerns for a list of the names of men in the proper age group and who are executives or hold other responsible positions. One thousand invitations to participate were mailed to these men, and about 300 were chosen from the resulting 900 volunteers. Each man is pledged to return for a thorough examination each year. How does the volunteer ben-

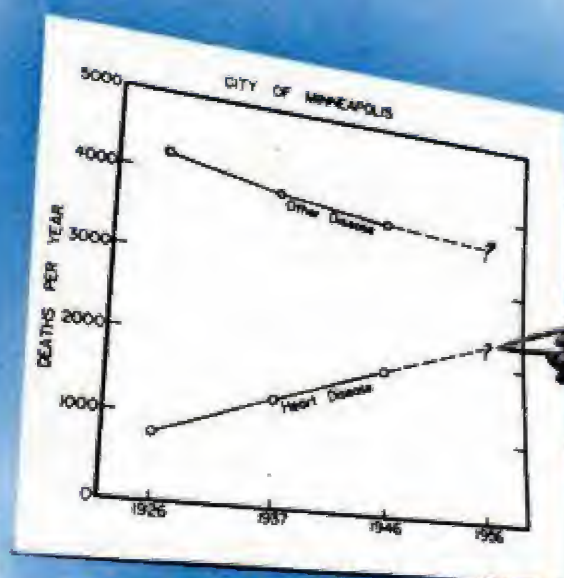
Half the people in the United States die from some form of heart disease. Doctor Keys shows how Minneapolis heart deaths climb steadily each year

efit? He is warned if the exam turns up any flaw in his health, and his doctor is given all information covered by the examination.

Doctor Keys and his associates, Doctors Taylor, Henschel, Simonson, Brozek, Mickelsen and Chapman, divided these 300 men into six groups of 50. Five of the groups were classified according to weight and age. Into the sixth group went men who have kept themselves in top shape over a period of years as witnessed by athletic directors who have worked with them. Thus the laboratory has a preliminary check on the effect of weight on heart disease, and hopes to find out what effects exercise may have on the ticker. If the scientists are successful the research may have a strong influence on living habits, as many persons feel that vigorous exercise is beneficial while some doctors advise that middle-agers cut down activities.

Why does Doctor Keys concentrate only on a group of men whose business responsibilities and living habits are similar? He is attempting to confine his research to a circle small enough to eliminate many of the variables. When heart disease shows up in the group, he wants to be able to put his finger on the cause, cutting down as far as possible the chance that the man's occupation has paved the way for the killer.

And heart disease most certainly will



strike this group. Insurance statistics prove that some of the participants will develop cardiovascular disease this year, even though they now are well. Eventually about half of these men will die of the disease.

The program calls for an exhaustive medical exam each year, an exam that plunges into fields strange to most exams. For example, little is known about the effect of fat on heart disease. True obesity has not really been examined in this connection. Insurance tables are made up according to actual weight, which is a poor indication of how fat a person is. People can be above average weight because they have much muscle, or because they have a heavy bone structure, or because they really are fat.

In order to find out how fat his "guinea pigs" are, Doctor Keys first weighs them on conventional scales, then seats them in a chair suspended above a six-foot tank and dunks them in water. Because fat is buoyant in water, their weight afloat compared with their weight in the air gives a true measure of how fat they are.

In another test the volunteer dangles his hand in a bucket of ice water. Local cold restricts the blood vessels, causing the blood pressure to shoot up. When this effect is pronounced, it indicates that the subject may be especially susceptible to heart disease even though he is in top shape during the test.

Exercise, of course, invariably boosts blood pressure. The volunteers "hike" uphill at various speeds on a motorized treadmill while a running record of their blood pressure is made.

The time it takes blood from the heart to reach the big toe is another phase of the research, as it indicates how elastic the volunteer's arteries are. Blood vessels, like rubber bands, gradually lose their elasticity. In the laboratory tests, a photoelectric cell is attached to the volunteer's big toe and a sound recorder is placed above his heart. The cell measures the light passing through the toe, thereby detecting the blood pulse. The time when the pulse started from the heart is known from the sound record.

Another lab project is to find out how much influence cholesterol has on heart disease. It is found in the

(Continued to page 254)



Comparing a volunteer's weight in water with his weight in air gives a true indication of the amount of fat he carries.

↓ How does cold weather affect blood pressure? In four out of ten subjects who dangle hand in ice water, pressure rises





Basement Swimming Pool

Jallette and his family take a dip in the swimming pool they built in the basement of their home. Concrete floor was dug up to make room for the pool. Below, from outside there's no sign that the house rests on a swimming-pool foundation



When members of the Jallette family of Woonsocket, R. I., want to go swimming they just dive into the basement. The cellar swimming pool was started 12 years ago when Ludger Jallette decided he couldn't afford the time to take his family to the beach. There was no room for a swimming pool in the yard, so Mrs. Jallette suggested they build one in the basement. The concrete floor was torn up with pick and shovel. At one point they hit quicksand; at another they struck a ledge they couldn't dig up. All the windows in the home were opened and a friend dynamited the ledge without blowing the house apart. The result is a concrete swimming pool that can be used all year. From the exterior, the home looks just as it always did, with no hint that there's a swimming pool under it for a foundation.

☛ Air freight and air express carried by the 35 established airlines of the United States has grown from 30,914,463 ton-miles in 1945 to an estimated 103,000,000 ton-miles in 1948.

Radio-Phone Talks Held Between Cities

To "assemble" top company officials in Chicago and Denver for bi-weekly staff meetings, United Air Lines is using a unique combination of radio, telephone and loudspeakers. Four nondirectional microphones and a loudspeaker at the conference table in Chicago are controlled by a recording secretary. He listens in on all conversations and regulates voice volume in both cities. His master-control cabinet plugs directly into any telephone circuit and connects with Denver through one of the company's private wires. Staff members at the Denver end use three "push to talk" handsets. A red light flashes



in Chicago when the conference-table mikes are alive, and goes off when the loudspeaker is turned on to receive voices of the officials from Denver.



"Airborne" Chickens Roost in Glider Nose

Something their designers never anticipated was that the noses of wartime gliders make excellent chicken houses. English users have found they are dry, draftproof and that the original windows provide sufficient light. Costing only a fraction as much as conventional chicken houses, they are eight by nine feet across the base and approximately seven feet high at the center.

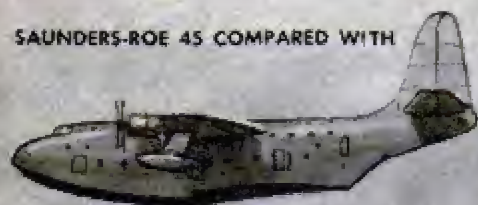
DOME-TYPE COACH for Italian train has all-around vision for sight-seers. Built by an Italian manufacturer, it was put on exhibit at the 26th International Fair in Milan

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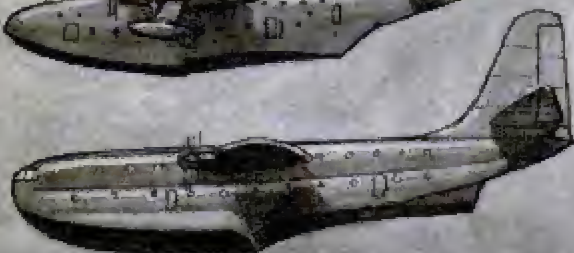


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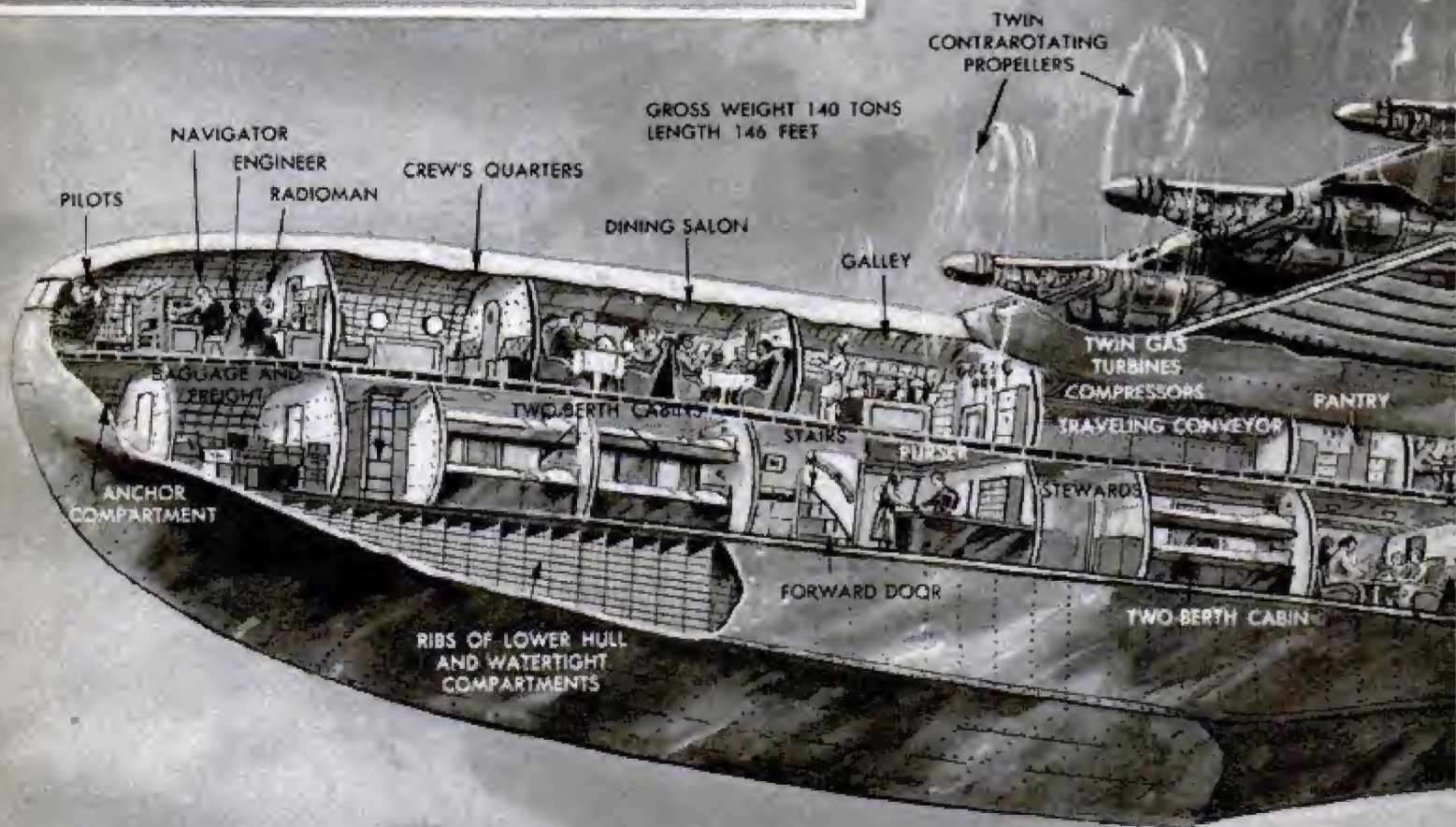


S.R. 45



HUGHES HERCULES

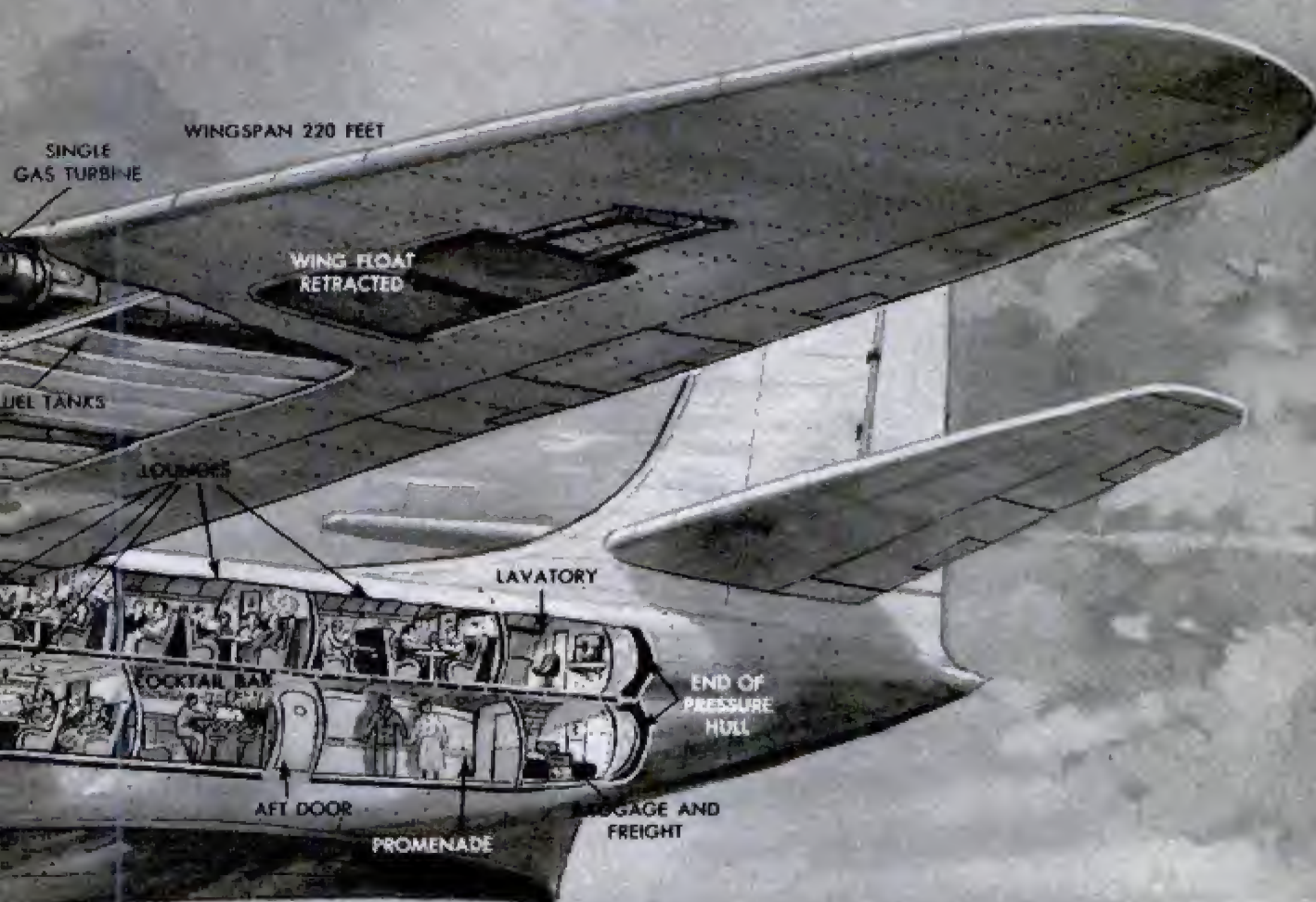
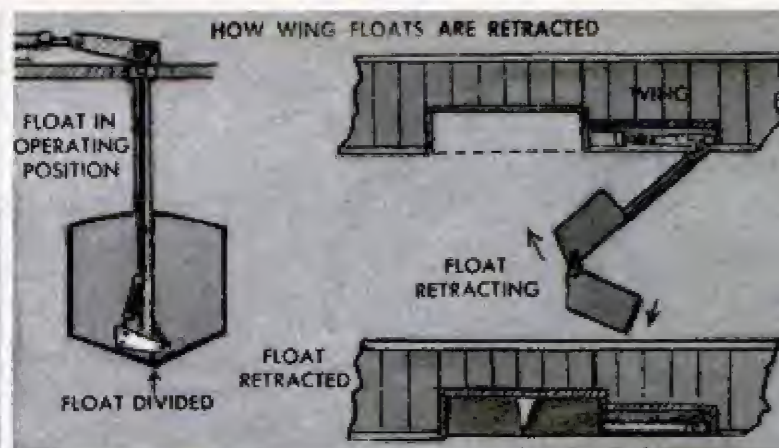
BRITAIN'S



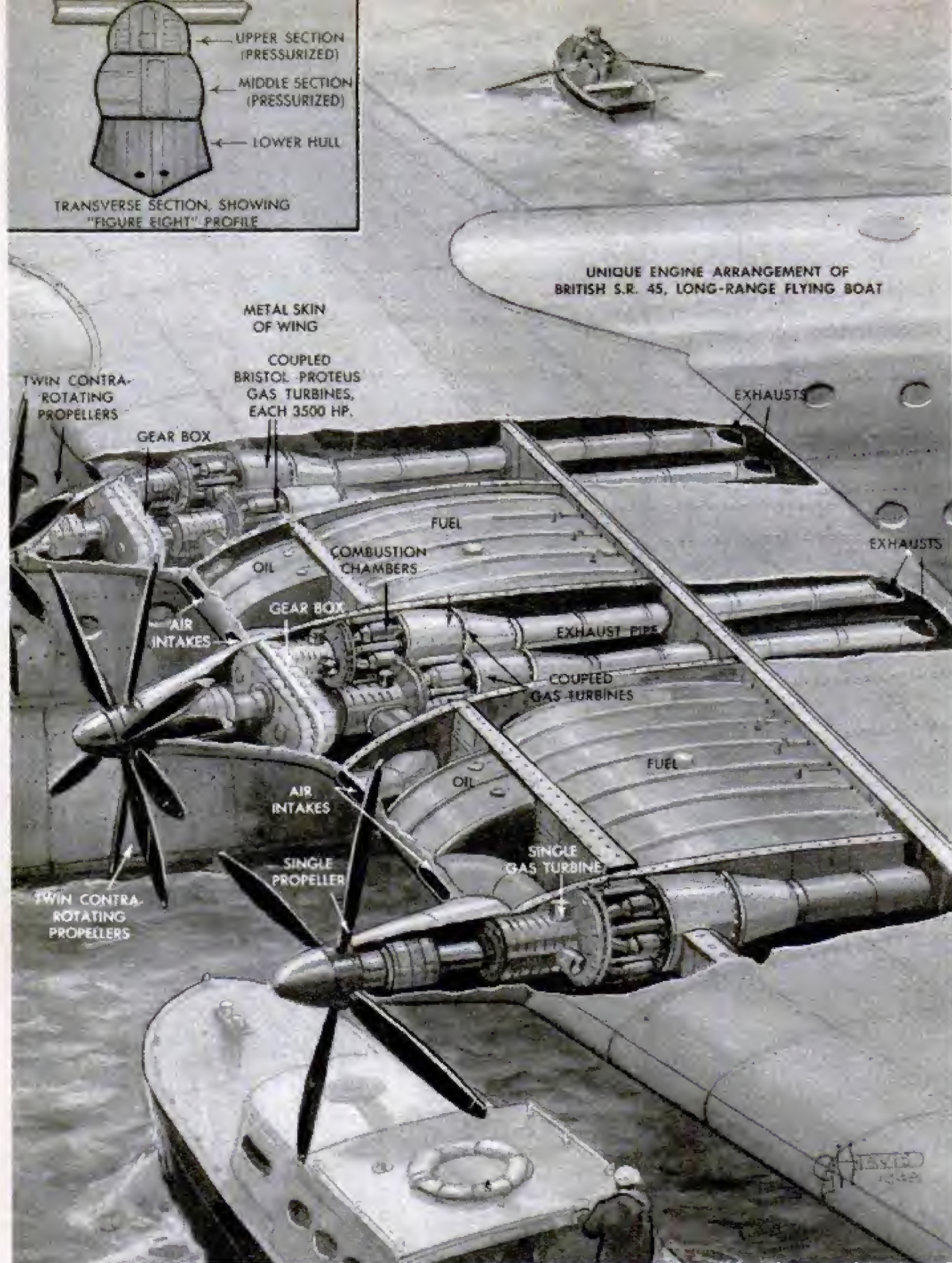
G. HAVES
1948



BIGGEST Flying Boat



FLOATS that "break in two" and fold snugly up into the wings will be pioneered when the Saunders-Roe 45, Britain's largest flying boat, takes to the air next year. To streamline the 140-ton craft for 350-mile-an-hour flights, the two floats are divided into watertight halves. During retraction the halves gradually hinge apart until they assume a thinner, flat shape that can be drawn up flush into the underneath side of the wing. (See upper-right illustration.) Eight of the plane's 10 gas-turbine engines, each 3500 horsepower, will work in pairs to turn four sets of contrarotating propellers. A special clutch system will make it possible for defective engines to be uncoupled in flight, with the other of the pair continuing to drive the propellers. The two outboard engines will be conventional installations. Cruising altitude will be above 30,000 feet. Three of the giant air boats are being built



Using two-stage reduction gears, eight engines work in pairs to turn four sets of contrarotating propellers

at Cowes, England, and each is expected to carry upwards of 100 passengers on direct New York-London service. From tail to nose they measure 146 feet, with wings

spanning 220 feet. The double-deck "figure eight" fuselage, which will be completely pressurized, is slightly more than 24 feet high at the center entrance.

Microfilm Reader

Microfilmed material containing letters less than 36/10,000 inch high can be read or copied on photographic paper with a projector that reduces eyestrain. The machine is designed for business use in reading and copying 16-mm. microfilm. An iris diaphragm enables the reader to control the illumination. One motor with four speeds carries the film through the machine, making it possible to reach an approximate location at high speed and then switch to a slower scanning speed. Copying the film on photographic paper can be accomplished in two minutes without a darkroom.



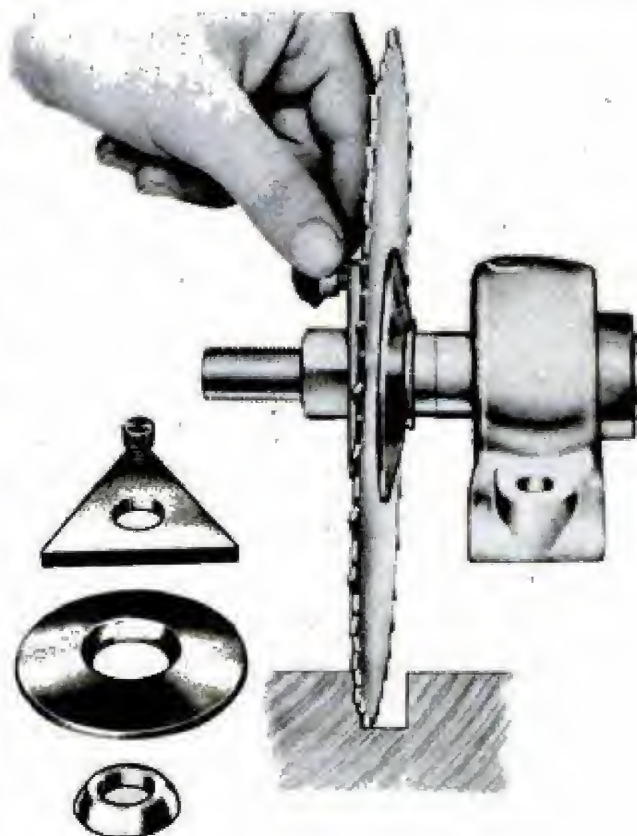
Tractor "Altimeter" Aids Contouring

Contour farming is made easier with a gauge that shows when the tractor is traveling on the level. It makes preliminary surveying and staking unnecessary. Mounted on the hood, the gauge has a pointer that indicates what percentage of the slope, up or down, the tractor is off the contour line. Side-hill tilt doesn't affect the indicator.



Lock Screw Adjusts Dado Collar

By means of a self-locking screw, an adjustable collar converts any circular-saw blade into an accurate dado cutter. The thumbscrew is turned to tilt the blade off center and the self-locking feature holds it at this angle. The attachment comes in two sizes, one for saw blades up to 10 inches in diameter, the other for blades 12 inches or larger.





PORTABLE BOWL for the MIDGETS

By Bill Reiche

WITH THE DEVELOPMENT of a fast, portable track which can be erected or dismantled in a matter of hours, midget-auto races now can go on tour.

The diminutive speed demons, which provide spectator thrills out of all proportion to their wheelbases, have been a big-time attraction even without the aid of a traveling raceway. About 30 million people see the races each year. But the tracks are something of a problem.

The mighty midgets sprint and skid on ovals that generally run a fifth or a sixth of a mile to the lap, which keeps the action right under the spectators' eyes. Outdoors,

dirt or board tracks are used, and occasionally concrete or macadam, but open-air racing is limited as to season except in the far South.

The greatest potential audience is in the larger cities, but there the cost of property makes it difficult to use a central location solely for racing. For all-year-round operation in northern cities, indoor sites such as armories are essential, but their





Pine boards locked together with tongue and grooves and cleats form the racing surface. Pine gives excellent traction and absorbs the oil

use for other purposes would be somewhat diminished by a permanent race track.

Nor are the tracks ideally designed for speed, many being inadequately banked or not banked at all. Under these circumstances races often degenerate into parades, since it is almost impossible for a driver to pass the lead car. Passing requires high speeds where the average is 60 miles per hour; unless the turns are

well-banked, the passer can't make the curve and might end up—with car—in the audience. A banked straightaway is also important to a fast race in that it gives a passing driver the benefit of gravity when he pulls down and ahead of another car.

When Alexis Thompson, millionaire sportsman, decided to introduce midget-auto racing to New York City this year he wanted to use a ball park, since it would be



Framework for the oval consists of aluminum trusses secured to vertical members by stainless-steel fittings. Putting together the track is as simple as assembling a child's building set—it just takes more time and labor



Drivers intentionally skid around the turns to make faster time. Midgets average over 60 miles an hour, which means they must roar down the straightaway at even faster speeds. Passing on a curve is dangerous but gives the crowd a thrill. Below, a jeep pushes a midget racer to start the high-powered engine



easy to reach and have ample spectator capacity. But the major-league parks are occupied half the days or nights from April to October; this meant he had to get his racing strip in and out of the park without building and demolishing a new setup every time.

A previous sports crisis provided the answer. Outdoor fights in the Yankee Stadium and Polo Grounds had seen 40 or 50 rows of "ringside" seats spread across the playing field. Anguished howls were heard from customers in the 45th row who were attempting to look over scores of heads between them and the ring without benefit of any elevation.

This situation had been met by the New York architectural firm of Leon and Lionel Levy. They devised a rising stand that was rigid, to withstand the explosive physical reactions of boxing devotees, and which could be set up and removed in a fairly short time. The Levy organization was given the assignment of designing a supertrack.

When Mr. Thompson approached Horace Stoneham, who

(Continued to page 250)



Shields End Drafts in Convertible

Plastic shields, mounted on the back of the front seat, end the back-draft that is a "pain in the neck" to many convertible users. They also reduce wind noise and permit driving with the top down on cool days. When not in use, the shields fold flat against the back of the seat.



Cultivator Has Engine in Rear

Built by a British gardener, a small power cultivator permits the operator to watch the blades as they dig into the ground. With its small gasoline engine in the rear, the compact unit is of tricycle construction. The driver sits directly above the blades in a conventional tractor seat.



Belt and Back-Stand for Grinder Smooth Bonded Brake Shoes

Bonded brake shoes can be smoothed with a single pass against an abrasive belt which can be attached to an ordinary bench grinder with the addition of a back-stand. The belt also can be used to remove worn brake linings which must be replaced. The contact wheel for the belt gives a resilient, wide-area surface for the work.



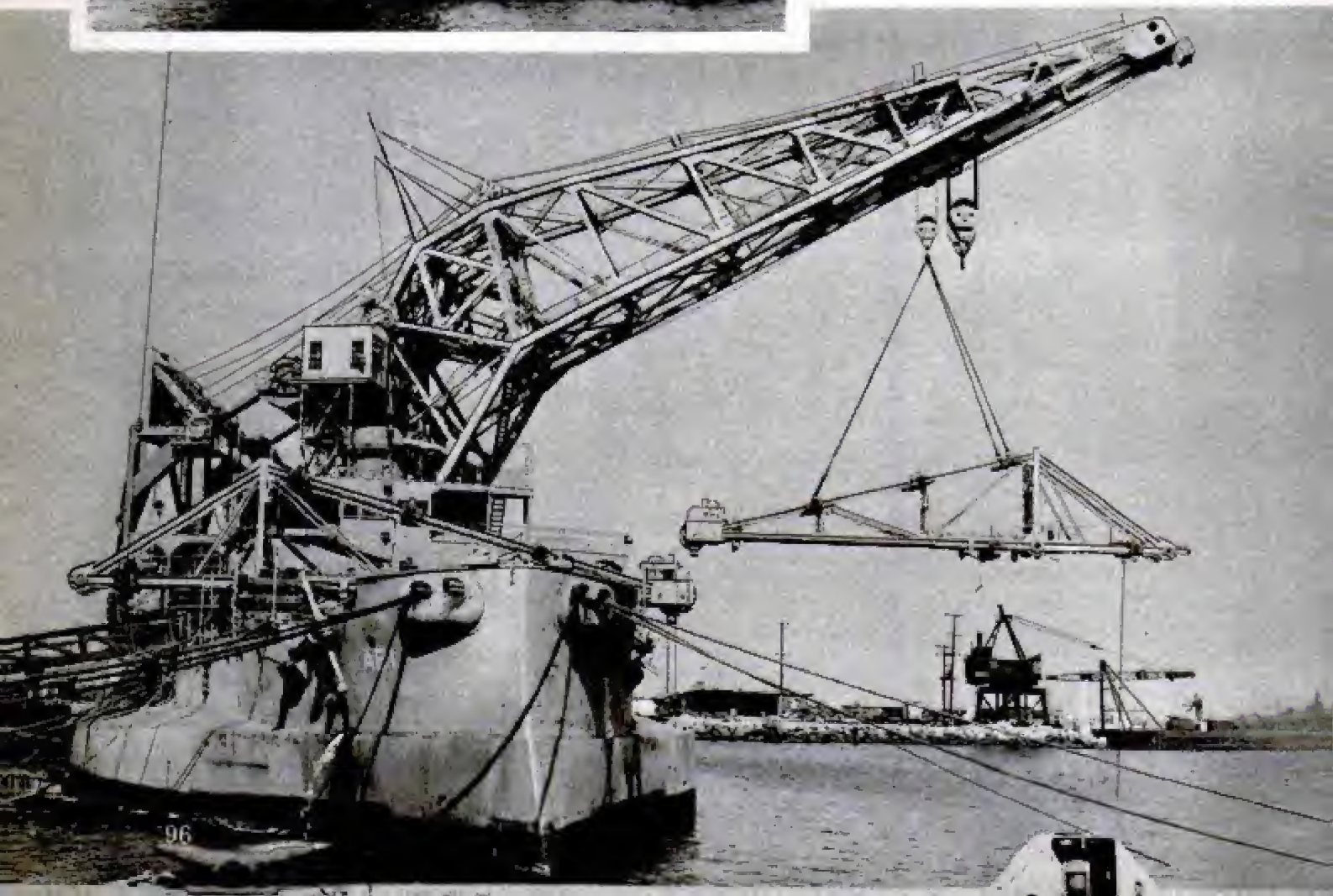
Lawn Mowers "Push" Themselves

Mowing the lawn at Rensselaer Polytechnic Institute requires more pull than push. The grass-covered slopes of the campus atop the Hudson River banks make mowing a problem. Keepers of the grounds remove the handles from their mowers, attach long ropes and let the machines roll downhill, cutting as they go. The mowers are then pulled back for the next cut.

ONE CRANE BUILDS ANOTHER



The German Navy was proud of its four giant floating cranes, which were the most powerful in the world. Above, a photograph taken during the war shows one of them lifting a 350-ton concrete block in a German shipyard. Today, one of these giants is working for the U.S. Navy and it is shown at left after it was reassembled in California. Below, to assemble the 374-foot-high colossus, Naval engineers used the crane mounted on the old battleship, USS Kearsarge. In the photo, the once-largest floating crane in our Navy hoists a jib boom of the former Nazi crane.



◆ One Crane Builds Another

IT TAKES a big crane to assemble a bigger one and that's the way the Navy put together the giant floating crane it received from Germany as a war prize. Towering 374 feet in the air, as high as a 30-story building, the 5000-ton colossus is one of four such cranes built by the Germans early in the war. Only one other is now in existence and it is in England. The others were bombed into uselessness.

Known as the YD 171, the giant crane was partially dismantled at Bremerhaven and towed across the Atlantic, through the Panama Canal, scraping through with only three inches clearance on each side, and up to the Long Beach Naval Shipyard.

Parts were made to replace those damaged during the war and the crane was assembled by means of another huge floating crane, mounted on the former battleship USS Kearsarge.

So that the Kearsarge could lift the heavy boom sections to the tremendous heights required, the pontoon of the YD 171 was placed in a battleship dry dock. The Kearsarge was moored alongside and, as the water was pumped from the dock, the pontoon dropped to a level 50 feet below the Kearsarge.

The YD 171 floats on a steel pontoon 204 feet long, 108 feet wide and 17 feet deep, with a mean draft of slightly over 10 feet. Quarters for a crew of 28 are provided inside the pontoon. Self-propelled, the crane makes eight knots and is sufficiently seaworthy for coastal voyages.

Directional propulsion is provided by three Voith-Schneider propellers, two in the stern and one in the bow. Each propeller has six vertical blades and revolves horizontally like a massive egg beater. By adjusting the pitch of the blades, the pilot can move the pontoon in any direction.

Capable of lifting 350 metric tons or more than 750,000 pounds, the crane generates its own electricity with three 900-horsepower Diesels. It is counterbalanced by a 400-ton block under the machinery house and a 200-ton counterweight mounted on the end of the boom.

The entire crane stands on a 60-foot circular base that revolves on a single roller bearing at the center. About eight miles of steel cable, some almost two inches in diameter, are used in the crane. The control cab is about 90 feet above the deck.

With this floating Goliath, the Navy can pick tugs right out of the water as easily as though they were toy sailboats. Flying the American flag, the YD 171, a former enemy, is now on our side, helping maintain the world's most powerful fleet.



Even Baby Can Have a Swivel Chair

Baby has his own swivel seat and can turn in any direction in a circular baby chair that cannot be overturned. Rubber-covered guard rails keep toys and dishes from sliding to the floor and also protect walls and other furniture. Mounted on four roller-bearing casters, the chair can be pulled from room to room. When the seat is removed, a matching disk converts the chair into a table for the children.

"Bean Ball" Shields for Ball Players

To protect batters from "bean balls," a new baseball cap has removable fiber shields that are placed behind the lining. Held in place by the sweat band, the shields can be worn on either side or on the front or back. Quickly removed, they can be taken out when the player is not at bat.



How the War Came to Me in Tokyo

I AM neither a historian nor a politician. I am not a journal-

By N. Sakata

ist. I am not a president or representative of any group of people. So this article is only a personal experience of a plain citizen in the war. If therefore this little article is given a chance to tell readers of this magazine something of actual experience of the intense war around a plain citizen, the purpose of it is fulfilled. For instance, how he fought with the intense fire; how he was astonished with the thunder of the navy gun attacking the factories on the shore, or how he was frightened with raining bombs from B-29, will be narrated.

It was early in the morning of December 8, 1941, that I awake to listen to a surprising news from a radio. My radio, in an Ozashiki of 8-mats room, was off at that time, as I usually do not listen to it before taking my breakfast. I am too busy to do so in the morning. I have to leave my house for the office, 20 miles far from my house, before 6:30 a.m., while I get up at about 6:00. All what I can do is to dress me up, nothing else. The reason, therefore, I chanced to switch it on was due to the fact that I had felt something strange vibration of the air around my house, maybe by the vibration of the air from the radio set of the house next to mine.

I experienced such an impatientness in synchronizing the dial as you do in picking up a thrilling news in hurry and was shocked from head to tip to learn an extra special government announcement of the outbreak of the war between Japan and America. I could not believe it at the beginning, but had to recognize it to be true soon. I doubted if it was the true will of our Emperor who was known as a man of peace-loving biologist, but to our sincere regrets its truthness was affirmed by the succeeding announcement of the War Department of the sneak attack of Japanese navy air force to the Pearl Harbor. Everything was finished and had come to the point we were destined to. We had never supposed that our international condition had been so critical as that we should learn it on that very morning.

I do not mean that Japan's foreign relation was satisfactory then at that time or that everything was going all right, but we had never expected the situation was

so critical. We thought and hoped that something could be done by

our government to arrive at the point wherein we could avoid the grave consequence with America. We therefore pinned much hope on the shoulders of our ambassador then in Washington. The newspapers spoke nothing of the imminent war before that time. The only thing we knew was that both Japanese and American governments were both doing their bests to arrive at the mutually beneficial understanding each other to brighten the situation. I therefore surely believed that nobody in Japan thought at that time that the war was inevitable, except military clique. The government had been concealing everything unbeneficial to them behind the curtain.

Japanese mass was so ignorant about the international situation as that they believed blindly that what the government announced was right and correct and that we had been forwarding righteously toward the world's peace. It was only the

morning of December 8, 1941, that our dream was awaken and we were forced to find out that the situation had been more critical than we supposed to be. In cars, in streets, in offices, in school campuses, what the people was talking about was of the war or about the prospects of the war. Frankly speaking, we intoxicated ourselves with the good news of the war in the beginning, but we did not

forget to anticipate the possibility of winning it out. Everybody thought that it was a tough job to defeat so many big, wealthy and strong countries. Everybody thought that Japan was facing to a national crisis. Sea-girt Japan is so small in size and limited in her resources. We had been fighting for so many years in China, exhausting her strength and energy. Everyone sighed a heavy breath at the world atlas. Japan is merely a group of tiny islands as compared with those of America, Australia, U.S.S.R. Successive good news however on the war in the beginning forced us to believe that we might have a glorious victory in a long run.

Hundreds of heavily loaded trains intersected the city of Tokyo from north to west day and night all 24 hours to carry soldiers and munitions to the southern

EDITOR'S NOTE — In the January 1924 issue of this magazine there appeared an account of his experiences in the great earthquake of 1923 by N. Sakata, for many years a correspondent in Tokyo for Popular Mechanics. Here, in his own words, is Mr. Sakata's thrilling and harrowing account of his experiences as America carried the war to Tokyo. It has been edited only where necessary to make understandable his Japanese-flavored English.



Beneath a shower of incendiary bombs Sakata and his wife search around their blazing home for their son

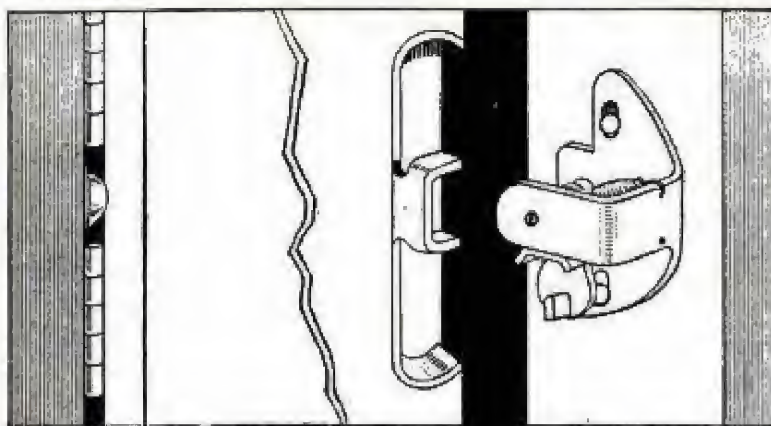
theaters. Soldiers waved out of train windows at the cheerful flags of citizens for trips never to return. Every factory was forced to convert productions into things all for the war. I was at that time with an affiliated company of one of the noted American companies, in the department handling the work of procuring the factory material. So far as my work is concerned everything progressed okay in the beginning, but as the stage developed on, I gradually began to feel something anxious in the prospects of the war, though the majority of the people was believing nearing of the victorious end of the war. The government announced Midway naval fighting as the overwhelmingly victory for us, and that we finally arrived at the turning point of the war for us. Actually it was a reverse condition. The conflict at Guadalcanal actually decided the man qualified to enter the glorious goal, though, according to the announcement made by the Japanese government, it was Japan. We were not allowed to possess any short-wave receiving sets in our homes at that time and it was by no means possible for us to listen to the world's truth.

Since those days, to counterbalance demands against supply, it became imperative to the government to establish the ma-

terial coupon system upon all kinds of material in order to give the first priority to the key industry. To this, nobody objected, of course, but it did not work out as scheduled. It was only in the beginning that it worked satisfactorily. It became almost impossible to divide the limited quantity of the material properly to all key plants. Many factories were forced to accumulate so many copies of coupons on the table as "VOID." In spite of so many days of painstaking labor and work spent in securing a single sheet of coupon for a single ton of steel, it was so easy to make them waste papers. Many factories overlooked machines idling without material to work on. Girls and boys were mobilized to factories for doing nothing, though, of course, there were exceptions. Large plants allocated with a large number of students were forced to hire special men dutied for finding some measures to make them busy.

When the plane of Admiral Yamamoto was attacked by American fighting planes on the ocean and died, the whole nation was environed with deep sorrow. We wondered why he dashed himself into the critical battle to kill himself, but thought that it should have been out of his personal belief that, as a typical Japanese general to

(Continued to page 228)



"Touch" Latch for Doors Requires No Knobs

Touching the flush edge of a door unlatches it when a new fastener is used. The latch eliminates the need for knobs or handles on otherwise unbroken furniture lines. It has a spring-operated arm with two projecting prongs. When the door is pushed shut a catch engages the arm to hold the door flush with the frame. If the door is to be opened, it is touched lightly; this pushes it inward about $\frac{1}{16}$ inch to disengage the catch, and the door swings out under power from the spring hinges. "Bullet" springs are available for use with ordinary hinges. Doors or drawers held by the latch can be opened with a touch of the elbow or back of the hand should both hands be full.

Top, pressing lightly on the flush door panel releases the latch. Left, prongs on the door engage the pivoted latch to hold door shut until it is touched again

Exposure Computer Built Into Camera

Correct exposures are computed right on the back of a new folding camera that has a built-in exposure guide. Operated like a slide rule, the computer gives the photographer the correct shutter and aperture settings for various weather conditions and film speeds.

The camera also has built-in flash synchronization and a new type of shutter release. It has an f:4.5 lens and shutter speeds up to $\frac{1}{200}$ second.



Retractable Rear-View Mirror

Controlled from inside the cab, an adjustable rear-view mirror for trucks can be extended or retracted to provide clear vision to the rear at all times. When extra clearance is needed, as in entering garages or narrow alleys, the mirror is retracted close to the body. The mirrors come in three lengths, the longest having a maximum extension of 28 inches.

☐ Probably the oldest living tree in the world is a Montezuma cypress, growing in southern Mexico, that has a trunk diameter of 52 feet and is believed to be about 5000 years old.

Pocket-Size Wind Indicator

You'll always know which way the wind is blowing and how hard if you carry a pocket-size anemometer. Precision built, the instrument has a built-in compass for determining wind direction and a velocity meter that shows wind speed in miles per hour. To protect the curved direction vane and the rectangular pressure vane when the instrument is carried in the pocket, the top half is removed and screwed to the base upside down.



Spring-Arm Phone Holder Leaves Both Hands Free

Holding the telephone ready for use, a "third hand" of flexible steel leaves both the operator's hands free to take notes during phone conversations. The spring arm holds the receiver to the ear and can be adjusted to the height and position of the user. The third hand was developed in Australia.



Pulp From Wheat Straw Produces Quality Paper

Pulp for quality paper can be made from wheat straw that is often destroyed after harvesting, the Department of Agriculture has announced. The new process produces yields of 50 percent of screened, bleached pulp, 5 to 10 percent higher than other processes using straw and most processes using wood. Scientists believe that

wheat straw will provide valuable pulp for blending with wood pulp in the production of magazine, book, writing and other papers of fine quality.



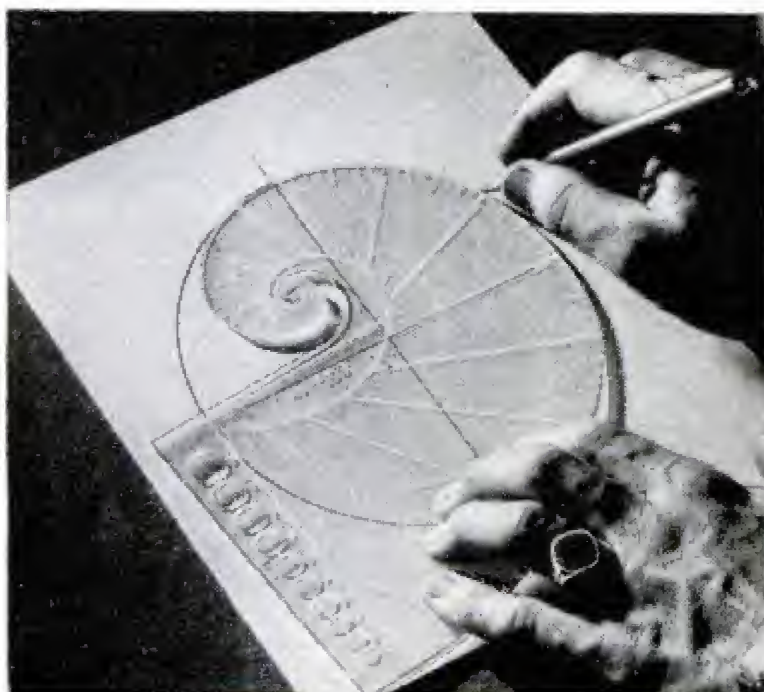
Bar Tool for Bending Metal Parts Adjusts to 100 Positions

With adjustable arms affording more than 100 positions, a handy bending bar bends, straightens, aligns, forms and spreads metal parts. No sledge hammer, vise or press is required. Arms, 36 inches in length, provide sufficient leverage without auxiliary equipment. In addition to straightening auto parts, the tool can be employed for fence pulling, straightening harrow and cultivator attachments and as a supplementary lifting and aligning device for heavy assemblies.

Guides for Ellipse Drawing

Ellipses of any size from $\frac{1}{4}$ inch to 12 inches can be drawn quickly and accurately with a set of clear plastic guides. Each guide is cut and ruled for a standard degree of ellipse. The set provides all standard projections from 15 degrees to 60 degrees. The ellipse is drawn in quarters by placing the guide in four positions on two perpendicular lines. A proportional scale etched in each guide gives long and short diameters of various ellipses.

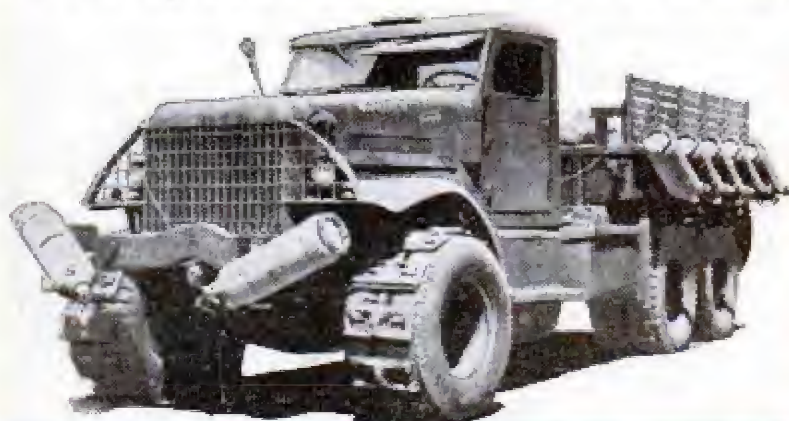
❏ Farmers in the United States are spending a billion dollars a year for repairs, remodeling and new construction on their farms.





Mired in axle-deep mud for Army test shown on cover, a "six by six" weighing 36,000 pounds was boosted to firm ground by 12 JATO units

Five jet-assist units were put on each side of test truck and two more were angled downward in front to blow mud out of the path



The folks who helped "jet" heavily loaded planes out of tiny New Guinea airfields are now busy finding more homely uses for JATO units. Such as boosting tired trucks out of mudholes and up steep roads, or putting emergency brakes on runaway mine cars

WHAT we want," the public-utilities official stated, "is an auxiliary engine that will help our construction trucks and trailers climb up into the mountains. The loaded vehicles weigh 33 tons and right now we grind along at six miles per hour. We want to get up those grades at 45 miles per hour."

The Aerojet engineer thumbed his slide rule for a moment and grinned.

"We have just the thing," he commented. "Five hundred horsepower in a package 18 inches square. How's that? Turn the auxiliary power on at the foot of the grade and cruise along as fast as you want. Only trouble is, you can't afford it. At \$2.50 per gallon, fuel will cost about \$1200 per trip."

The compact motor the engineer described is a lightweight rocket-driven turbine, comparable to the turbine that drives the fuel pumps of a V-2. It uses Diesel oil plus a liquid oxidizer as fuel. It makes relatively little noise and needs no muffler. It's cooled internally by steam in the rocket chamber. It produces 500 horsepower at 30,000 revolutions per minute.

As a booster engine for a truck, the turbine would be connected to the vehicle's drive shaft by a fluid coupling that would also serve

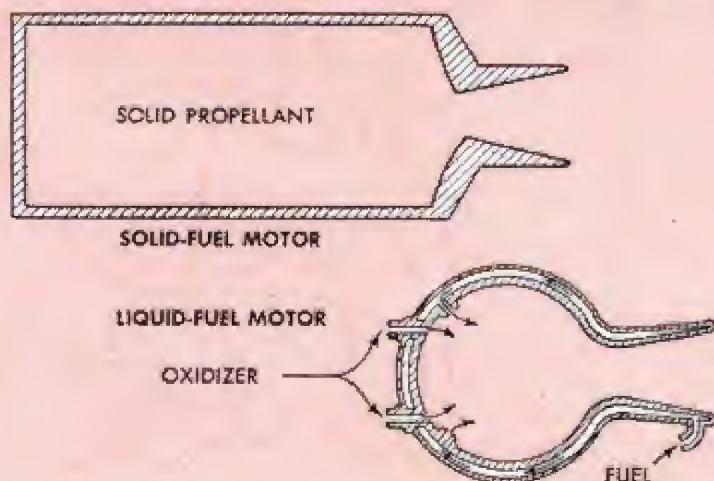
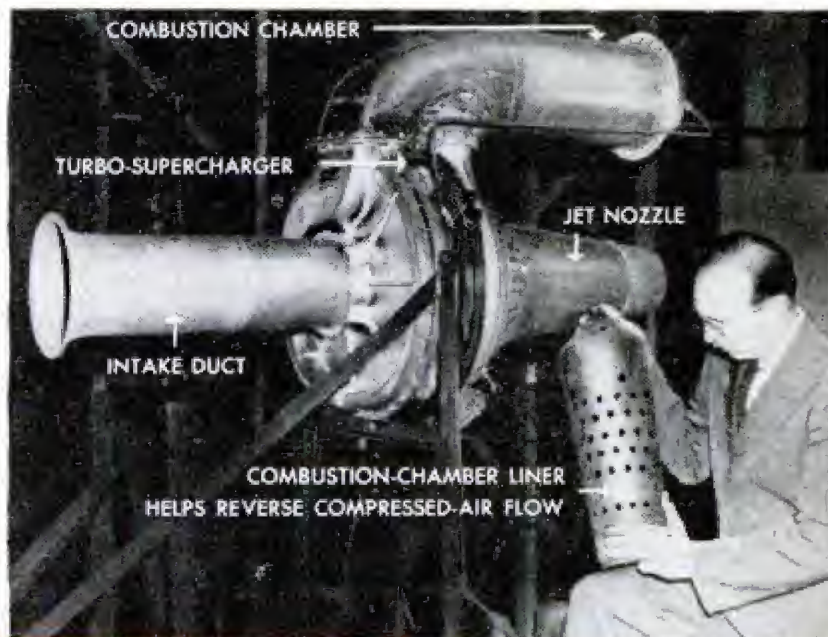
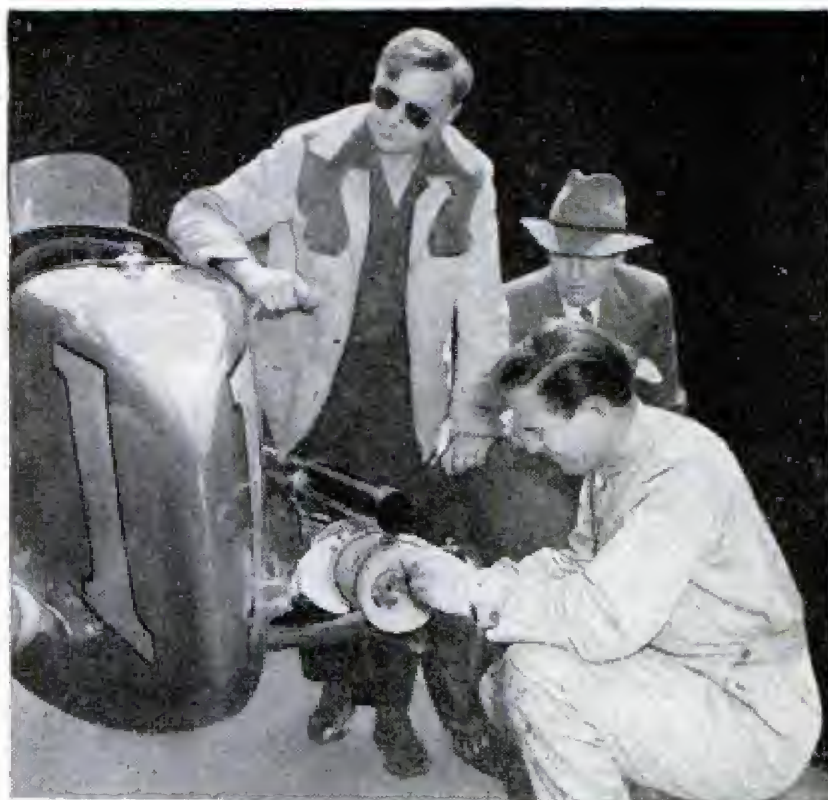
Jets
**LOOK
FOR
JOBS**

as a gear-reduction device. The idea is entirely practical, except for two things—the present high cost of the oxidizer and the size of the tanks that would be needed.

Emergency rocket brakes for runaway mine cars, rocket-powered posthole diggers, rocket-driven surfboards for lifeguards, rocket-type remote-control fire extinguishers; all these, plus the auxiliary rocket engine for trucks, are among the unique ideas that have sprung out of research in rockets, guided missiles and gas-turbine studies.

Looking into the future, Aerojet Engineering Corporation of Azusa, Calif., has been giving serious study to some of these ideas. Dr. F. Zwicky, Dr. Theodore von Karman, and other scientists on the staff know that a device that seems worthless today may suddenly become important and practical tomorrow. Aerojet, a subsidiary of The General Tire & Rubber Company, manufactures jet-assisted take-off units in various sizes. It built the Navy's Aerobee sounding rocket that recently climbed 80 miles into the stratosphere.

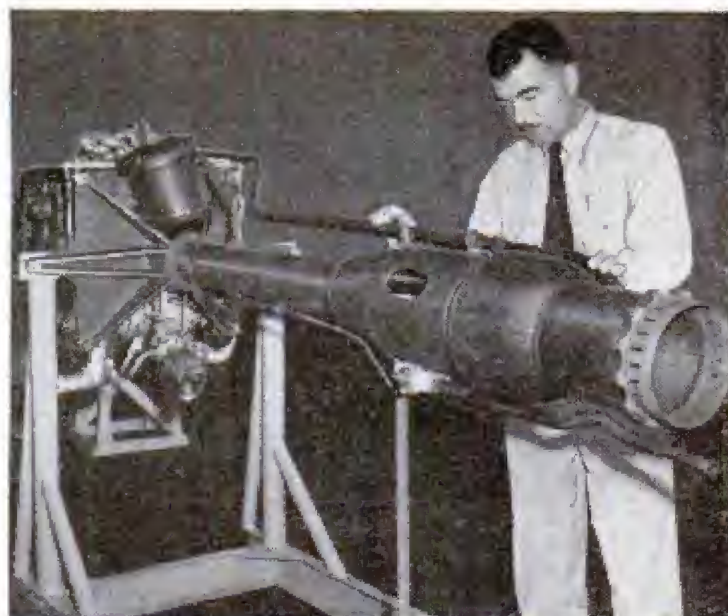
Aerojet's JATO units are standard equipment for helping heavy aircraft up into the air from small fields. The units shorten the take-off runs of jet aircraft and assist very heavily loaded planes in



Racing driver Duke Nolen, top, tests additional thrust given by rocket motor at rear of car

Above, war-surplus supercharger and ducting are converted into gas turbine for drone plane

Simplified drawings of two main types of rocket motors. The one above uses solid propellants, as in the case of the JATO units, and the other runs on liquids. Excessive cost of fuel is the bugaboo of rocket development



In German device for aiding plane take-offs, left, row of bottles contains compressed air to force fuel into combustion chamber. Plane using 4000-pound-thrust rocket at right consumes two tons of fuel in three minutes

getting off runways at high-altitude airports. When mounted under the fuselage with the nozzle faced forward a JATO becomes a powerful emergency brake. A BT-13 has been stopped in 112 feet from a touch-down speed of 85 miles per hour by means of rocket brakes alone. It is calculated that a rocket exerting a reverse thrust of 54,000 pounds would slow a DC-4 from 111 to 56 miles per hour in no more than 307 feet.

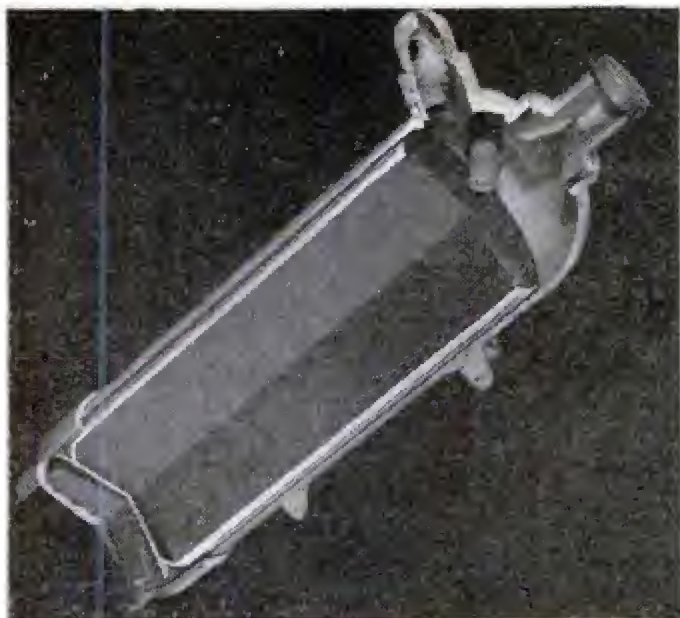
When Aerojet was asked to design an emergency brake for the cars that carry miners up and down steep inclines it came up with a governor-controlled rocket brake that would act automatically if the car's cable happened to snap. For a loaded car of 10,000 pounds on a 30-percent in-

cline, the emergency brake would consist of six standard 1000-pound-thrust JATO units secured to the lower end of the car, each fitted with an elbow nozzle pointing downgrade. With a protective bulkhead the installation would weigh 1500 pounds. It would be set to operate automatically at any time the car attained a speed of 26 feet per second. The blast from the rockets would bring the loaded car to a stop after 7.6 seconds of deceleration, after which grip brakes would clamp onto the rails to hold the car in place.

The traditional task of a rocket motor is to propel something through the air, but Aerojet's Doctor Zwicky points out that there are four media through which a vehicle may be propelled—vacuum, air, wa-

GETAWAY: Added lift afforded by JATO units makes it possible for big planes to fly from small fields





Cutaway of JATO bottle, left, shows solid fuel, igniter and thrust nozzle. Rockets may some day be used as fire extinguishers if fuel with enough carbon dioxide is found. Right, oxidizer being poured into cylinder

ter or the earth. Rockets have conquered each medium including the earth.

A rocket-driven ram for digging post-holes sounds silly when you reflect that one man with a shovel can dig a hole in a few minutes. Under some military circumstances, however, the rocket ram might be desirable and the idea has been tried out experimentally. A steel rod with a JATO unit attached to its top is planted in the ground, then the JATO is fired. The thrust forces the rod downward into the earth.

The ram may have real merit as a tool for prospecting for oil deposits under coastal waters. Here the problem is to bury an explosive charge deep in the ocean bottom so that shock waves reflected from underground strata may be recorded by

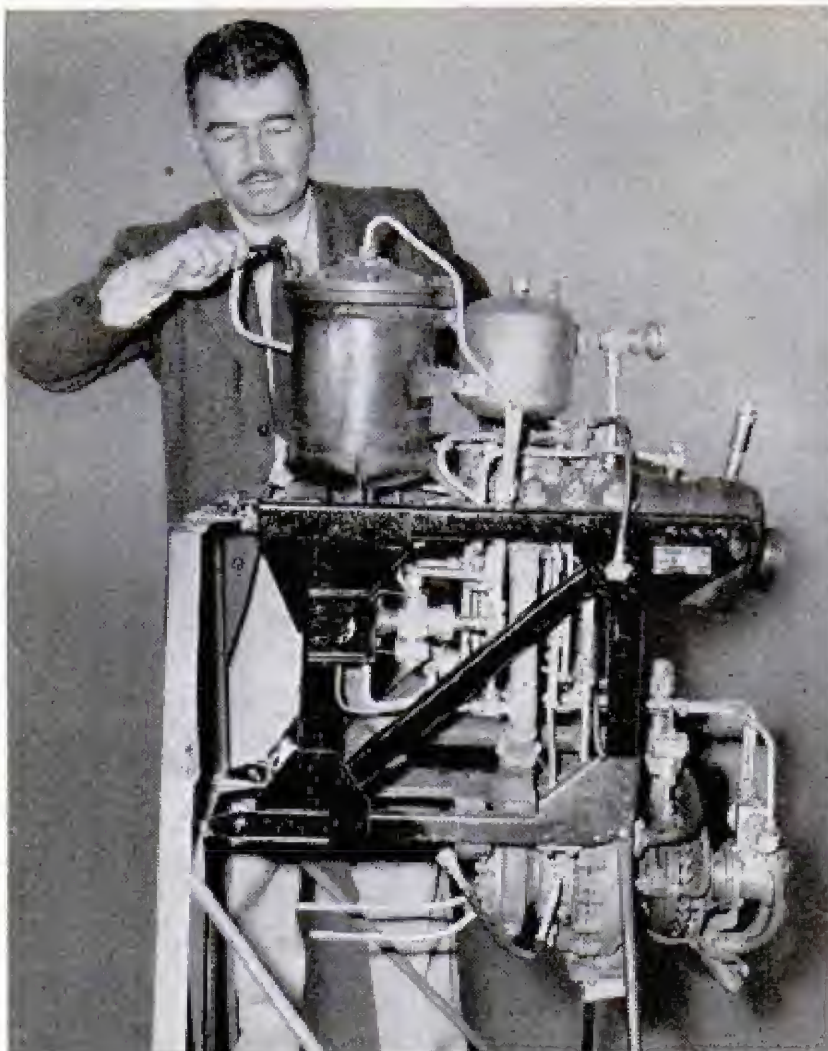
seismic instruments. The present technique is to explode the charge underwater, but geophysicists would prefer actually to bury the charge in the subterranean mud. Rocket rams already have been used for taking cores from ocean bottoms and the oil-prospecting companies expect to test them for this new use as well.

The Coast Guard has been thinking about using rockets to help launch rescue craft through heavy surf, and a small rocket attached to a surfboard has been suggested for lifeguards who need speed in getting out to help a drowning person.

Any time a speedboat enthusiast wants to try for a new unlimited world record for power boats, Aerojet is ready to furnish a power plant with which all existing

BRAKES: Used as brake for aircraft landing, rockets alone stop a BT-13 traveling 85 miles an hour in 112 feet





Steam is produced in the built-in turbine of the rocket motor above by spraying hydrogen peroxide over sodium permanganate pellets

marks could be smashed. All that is needed now is a suitable hull. The motors themselves would cost only a fraction of the price of conventional power plants.

Engineers estimate that three 1000-pound-thrust JATO units firing through the stern would drive the boat at a speed of 172 miles per hour over a one-mile course. One motor, of 12-seconds duration, would be fired first to accelerate the boat to high speed from a standing start, then the other pair of motors, each of 30-seconds duration, would be ignited to drive the boat across the measured mile. More rockets would provide even greater speed. John Cobb, incidentally, could have added another 20 or 30 miles of speed to his automobile record of 400 miles per hour at Bonneville salt flats last year if he had attached one rocket motor weighing 200 pounds to the tail of his car.

Once the Army posed a unique question: Suppose a heavy vehicle is stuck in the mud. It can't haul itself out and no towing apparatus is available. Could rockets lick the problem?

Aerojet had to try it to find out, and the answer was an unqualified "yes." A six-

ton "six by six" loaded to 36,000 pounds gross weight and equipped with track-type mud cleats was driven into a mudhole so deep and slippery that the driver couldn't move his vehicle. The rear wheels spun futilely each time he applied the power.

Five JATO units were then attached to each side of the truck, directed downward and toward the rear so as to provide upward and forward movement at the same time. Two additional units were angled downward and toward each other across the front of the truck to serve as sweeps for blowing liquid mud out of the way.

When the driver pressed the firing button there was a terrific roar and a blast of smoke and the truck literally shot out of the mudhole onto dry ground.

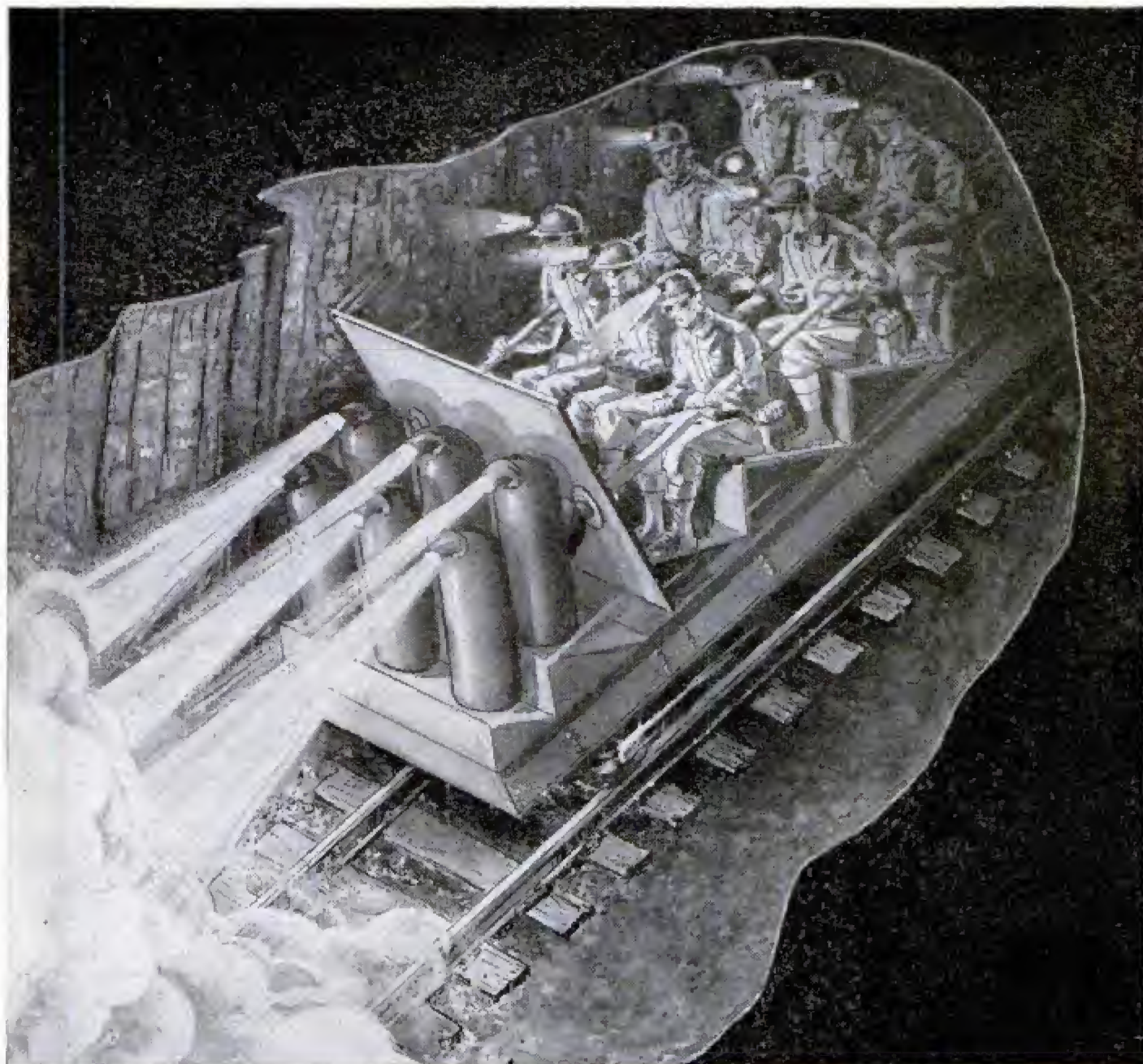
That's an expensive way to rescue a truck, of course, but it might pay off in some circumstances. One suggestion concerns the heavily loaded cementing trucks or well-survey trucks used in the oil fields. Rockets might prove to be a cheap way of extricating such a truck, stuck in boggy

ground, in cases where a rush schedule must be observed.

An idea that is very intriguing to rocket men is to use them as fire extinguishers. What they envision is a rocket fuel that would produce a large percentage of carbon dioxide, an effective fire-quenching agent, in its combustion gases. Present fuels produce some carbon dioxide, but not enough to kill a persistent fire.

A fire-extinguishing rocket unit, of course, would have to be securely fastened in place. It could be operated either by remote control or by means of an automatic heat switch. A blast diffuser, too, would have to be attached in front of the nozzle to cut down the rush of combustion gases which otherwise might scatter the fire. If the right chemical fuel is found, rocket extinguishers may become practical.

Fuel, in fact, is the principal bugaboo of rocket development. There are various combinations of chemicals that produce the necessary thrust of gases but the objection is that the fuels are expensive and are consumed at a prodigious rate. A V-2 rocket, the largest built to date, consumes five tons of alcohol and five tons of liquid



Emergency rocket brake has been tested for mine cars on steep inclines; it works automatically if cable snaps. One blast would be adequate to halt a fully loaded car on a 30-percent slope after 7.6 seconds of deceleration

oxygen during the 20 seconds or so that its motor is operating.

For their rocket interceptor planes the Germans devised a different fuel consisting of hydrazine hydrate, methyl alcohol, and water and potassium cuprocyanide. They used an 80-percent concentration of hydrogen peroxide as the oxidizing agent. Even this fuel was inefficient from the weight standpoint. Two tons of it produced only three minutes of powered flight.

Rocket-fuel research is of such scope that major portions of it have been "farmed out." Cal Aero Technical Institute of Glendale, Calif., for instance, is engaged in a big program of testing German rocket and gas-turbine engines for Wright Field, especially to improve upon the original combustion chambers.

An interesting sidelight on gas-turbine

research is the building of small gas turbines from surplus turbo-superchargers. The superchargers were used in nearly all American bombers and in many fighter aircraft during the war and since then it has been discovered that the superchargers can easily be rebuilt into gas turbines.

The original superchargers consisted of a drive shaft to which was attached a turbine wheel and a compressor. Conversion consists principally of adding sheet-metal ducting. Air from the compressor is led to a simple firebox where kerosene or other jet fuel is burned, and the combustion gases are ducted back to the turbine wheel and from there to an exhaust nozzle. One converted turbo unit has enough power to fly a small plane of the drone type, and two of the small gas turbines provide enough power for a one or two-place light plane.

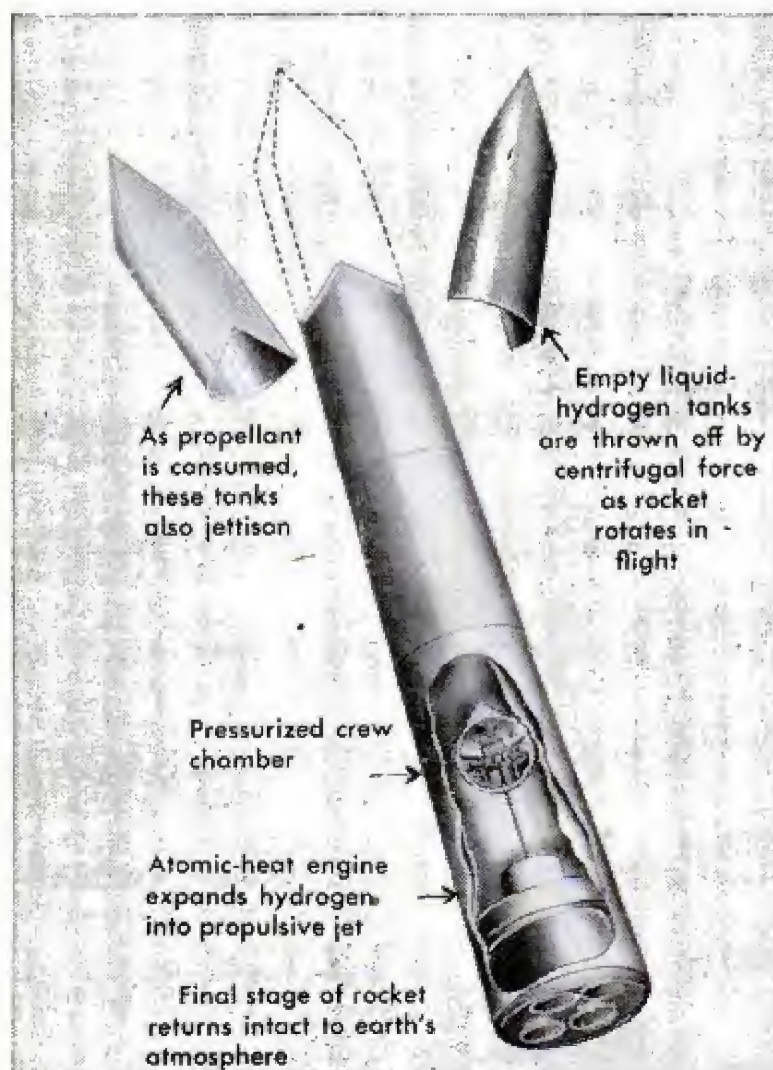


Combination Power Tool

With its sanding disk mounted on the bandsaw drive shaft, a combination power tool provides the home craftsman with two tools in one. The bandsaw cuts wood, plastic and soft metal to the center of a 14-inch

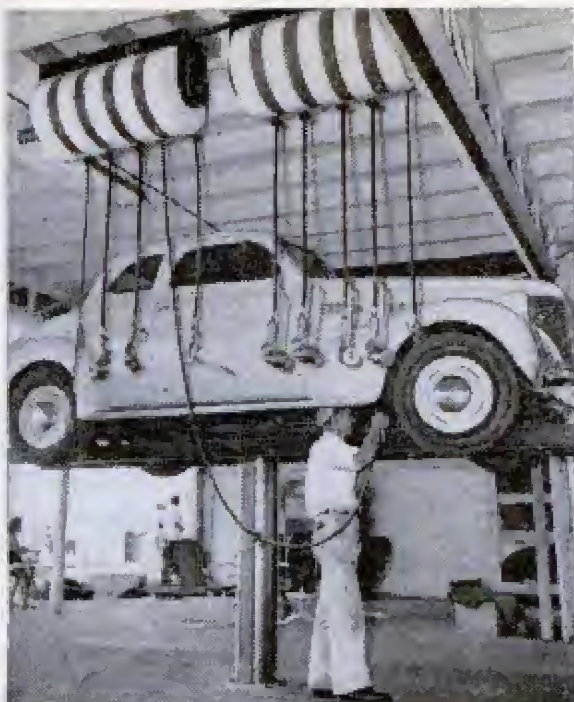


circle. Using the bearing system of the bandsaw, the vertically mounted sanding disk is nine inches in diameter. Both the bandsaw table and sanding table have angular adjustments for accurate work. They operate on $\frac{1}{8}$ or $\frac{1}{4}$ -horsepower motors.



Atomic-Powered Rocket For Carrying Man to Moon

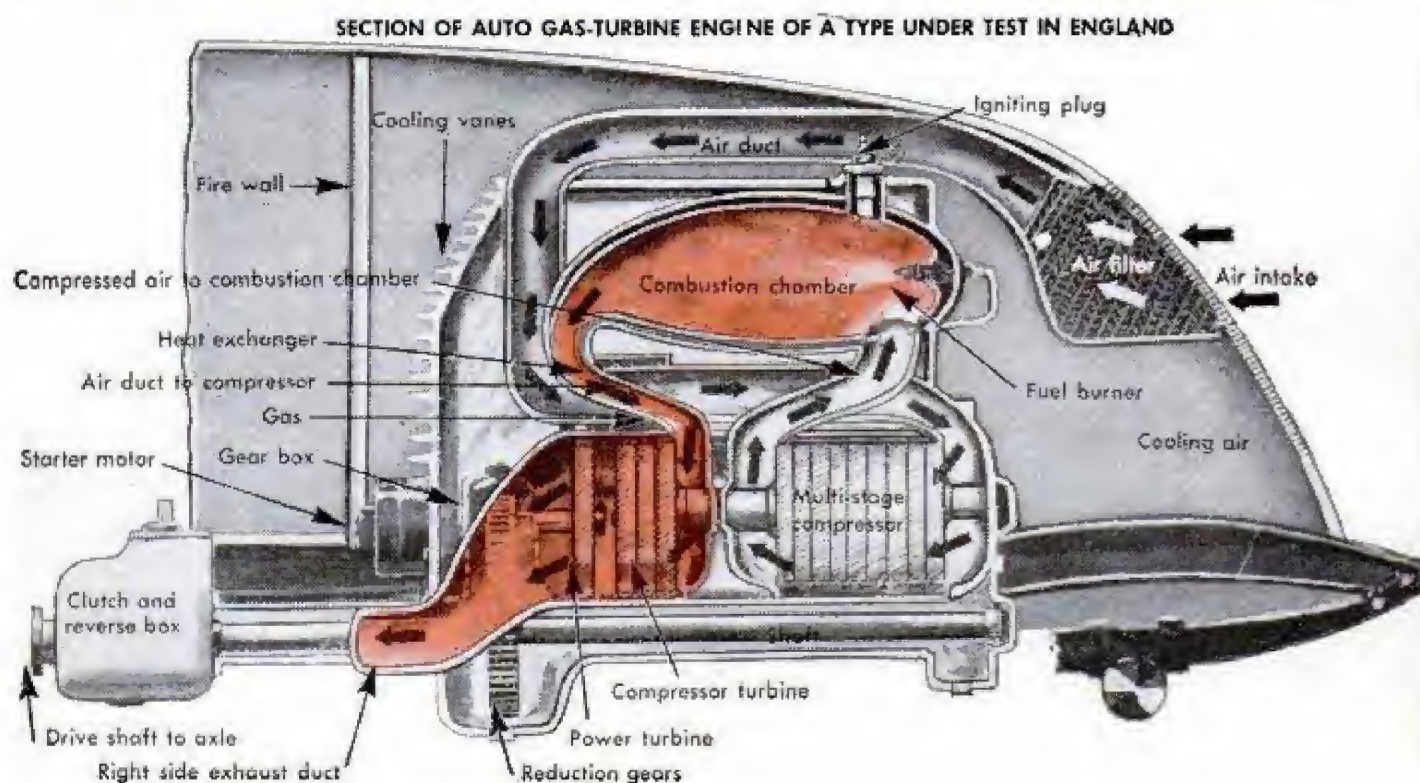
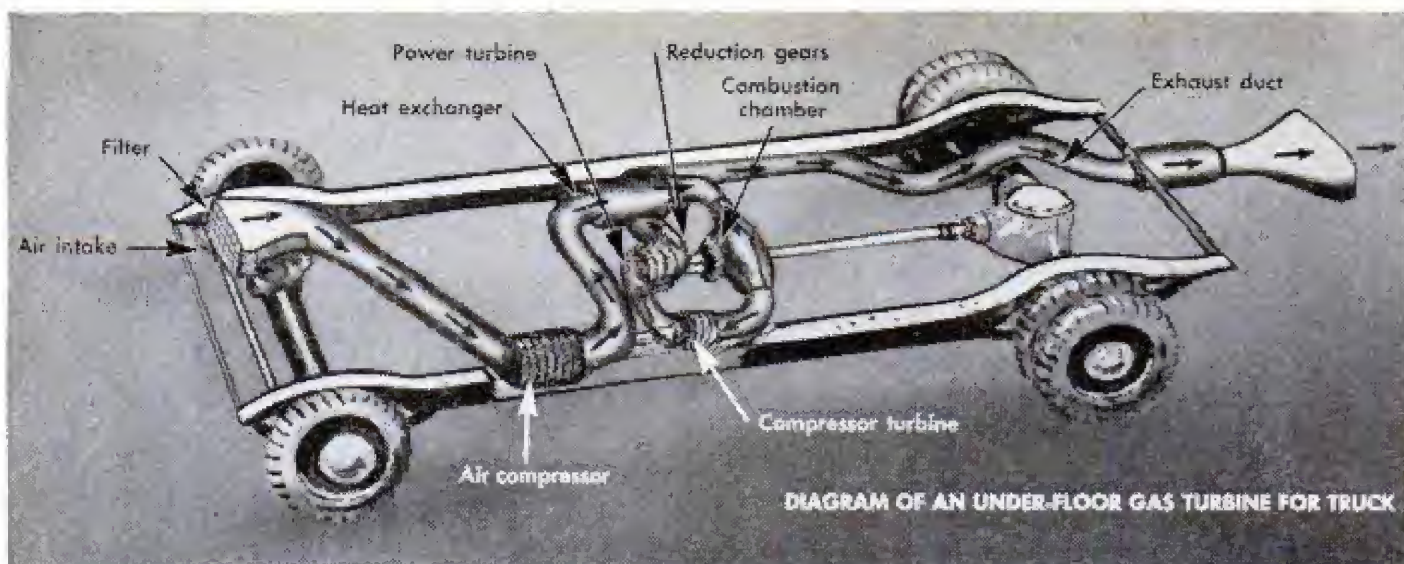
Around-the-moon flights of man-carrying rockets, powered by atomic energy, are foreseen by a member of the British Interplanetary Society. The rockets would have to weigh about 1500 tons, 80 to 90 percent of which would be stored propellant. A high temperature pile would supply the heat energy to a fluid, like liquid oxygen, just as chemical reaction now does in chemical rockets. The rocket conceived has a single propulsor, or motor, and uses fuel drawn from four tanks that jettison successively from the nose. As the first three tanks emptied en route to the moon, two separate bays in each would divide and be thrown off by centrifugal force. A fourth would head the vessel earthward. Reverse-thrust motors would use the remaining propellant to brake the rocket's speed sufficiently for it to re-enter the atmosphere, where the crew chamber would be parachuted to the surface. A strobo-periscope would provide stationary external vision from the rotating cabin.



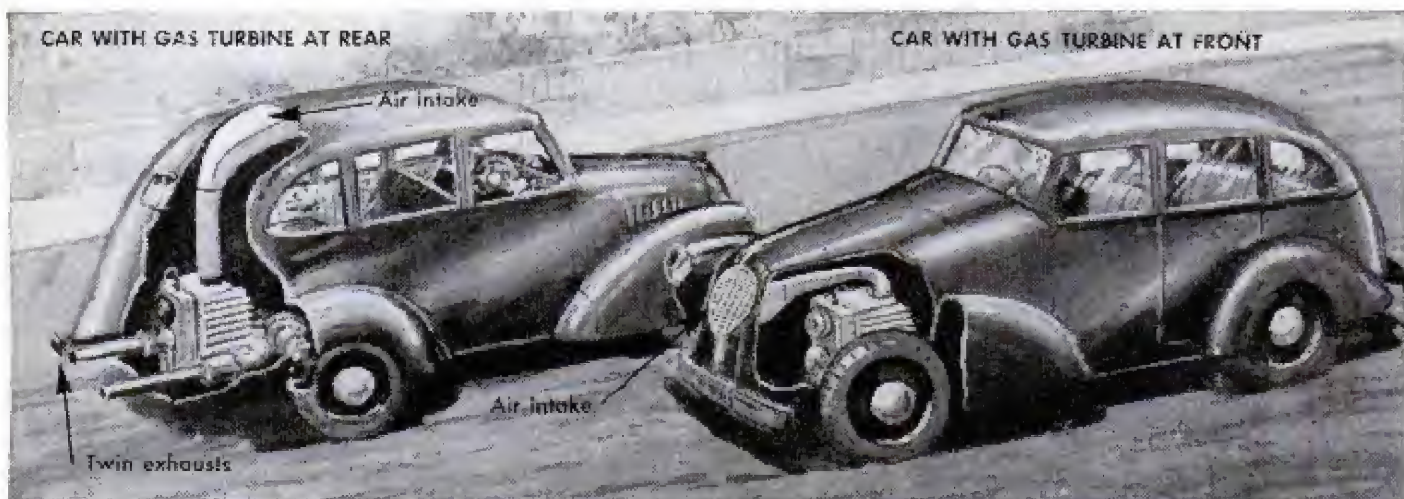
Cafeteria GAS STATION

Service is only as good as the driver makes it at some of the new serve-yourself gas stations in California, but the motorist saves four or five cents per gallon of gas. Top, one of few attendants is at grease rack, where metered outlets show amount of grease used. Top right, at central booth girl attendants get the change for motorists' money. Right, girl awaits payment as driver helps himself. Below, "oil bar" near rear of station sells numerous brands at cut prices. Cars must be driven to the bar for service





Top sketch shows how a gas-turbine engine could be installed beneath the floor of a truck. In the cutaway diagram above, air is drawn into the engine, compressed and pushed into the combustion chamber where it burns with the fuel. The expanding gases that result drive the power turbine and the compressor turbine. Below, sketch shows how a small gas turbine could be installed either at front or rear of a conventional car



GAS TURBINES FOR CARS

WITHIN a few years, many automobile engineers believe, the standard family car will scoot along the highways powered by a gas-turbine engine. Especially active in the development of small gas turbines are British engineers. Two turbines small enough to fit under an auto hood are now under test in England.

The gas turbine has many potential advantages over conventional high-compression engines. No gearshift is required, as the speed of the turbine is variable; a turbine-powered car equipped with one reverse gear and one forward gear could be driven just like an auto with fluid drive. The only ignition system required for a gas turbine is a single igniter plug. The engine requires no fan, radiator or water pump as it is self-cooling. It can burn kerosene or any other fuel which burns continuously. It is lightweight, practically free from vibration, and delivers a smooth, continuous flow of power.

The artist's sketches on the opposite page show the smaller of the two turbines under test in England—an engine specifically designed for the family car. It measures three feet long, 18 inches wide, 20 inches high and has a diameter of 15 inches. At a normal speed of 55,000 revolutions per minute the turbine develops 100 horsepower. It weighs only 475 pounds complete with gearbox. The heat exchanger reduces fuel consumption.

In operation, the engine draws air through a filter and passes it into the combustion chamber where the fuel is burned. The high pressure from the expanding gases drives two separate turbines, one for compression and the other for power. A gearbox relays power from the power turbine to the wheels.

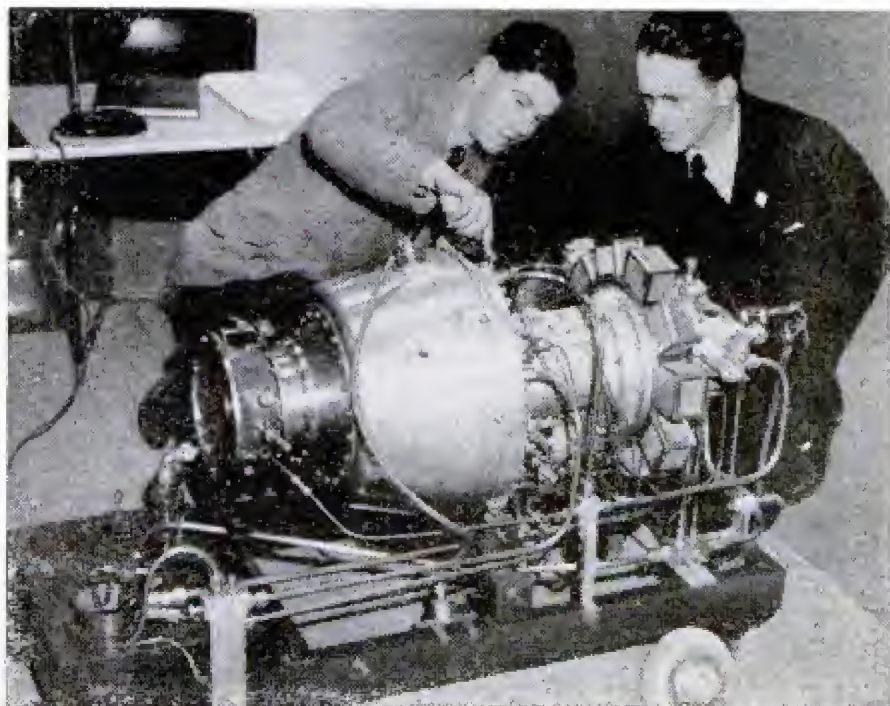
Such an engine could be installed either under the hood or in the rear compartment of a conventional car. Besides its other advantages, the turbine has few moving parts and therefore should be much less expensive to maintain.

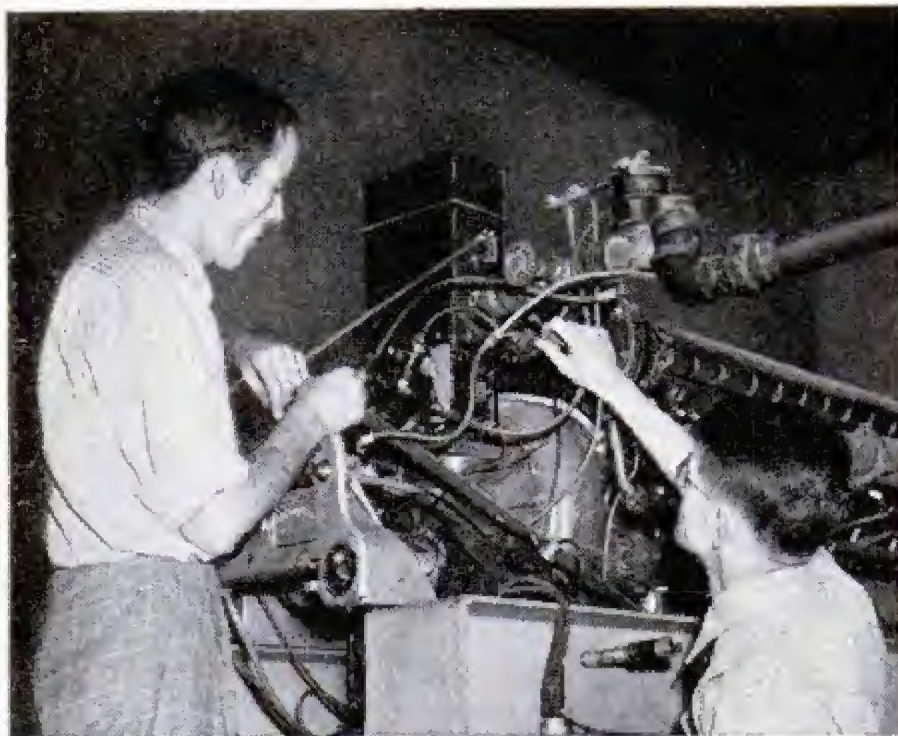
Larger gas turbine designed in England will power large cars, trucks and buses. It weighs only 250 pounds. Gas turbines can burn most fuels including kerosene, paraffin — even coal

The other engine under test, shown on this page, is designed for larger cars, trucks and buses. It is 17 inches in diameter and five feet long, but weighs only 250 pounds. A single spark plug fires the fuel-air mixture which continues to burn as long as the engine is running. Exhaust fumes are expelled through twin pipes with no more pressure than that in conventional engines. The turbine is designed to run at speeds from 40,000 to 42,000 revolutions per minute. The output is about 160 brake horsepower.

The engineers' biggest bugaboo has been the development of metals which can withstand the intense heat generated in the turbine. Special alloy steels and nickel-chrome alloys are now being used, but they are extremely expensive and boost the cost per unit. Parts must be turned out to very fine tolerances, which makes large-scale production difficult. Another problem is to decrease the rate of fuel consumption; although inexpensive fuels can be burned in a gas turbine, they are burned at about twice the rate of a good piston engine.

Family autos powered by gas turbines will not be on the road until these problems are answered and methods worked out for large-scale production. But British engineers are confident the gas-turbine models now under test are forerunners of engines that will be much more efficient than the complicated piston engines that power today's cars. They believe that within three or four years, motorists will be seeing gas-turbine cars on the highway.

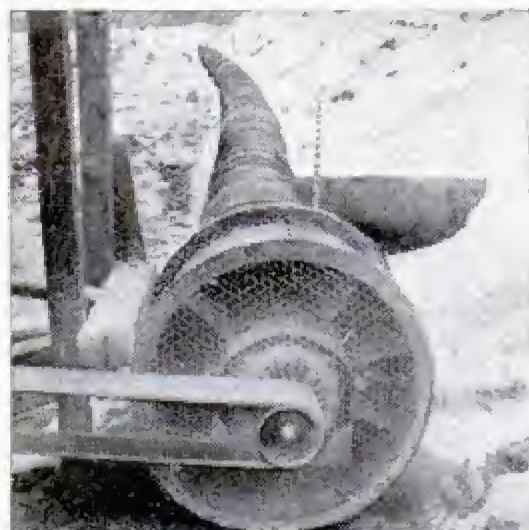




Natural Gas Runs Big Aircraft Engine

To cut down costs, natural gas has been substituted for high-octane gasoline in running a 12,000-horsepower aircraft engine at the University of Oklahoma. Use of the engine in operating the Department of Aeronautical Engineering's wind tunnel would have been severely restricted by the present high price of aviation gasoline. It is cooled by pumping water from a forced-draft cooling tower. Considerably less engine wear is expected with natural gas.

Blower Forces Heat From Stack of Sugar Beets at Night to Aid in Storage



Above, ventilating blower, which is turned on during the night, forces air through main ducts and then into lateral ducts to ventilate the stacks. Above right, stack of beets is covered with heavy paper during the day to prevent natural ventilation. Right, instruments record the temperature in center of pile

Sugar beets can be stored with the aid of artificial ventilation, according to research workers at the Colorado Agricultural Experiment Station. For best results the beets must be held at a temperature near 32 degrees without freezing. This can be accomplished in areas where night temperatures are near freezing. The beets are stacked in huge piles, which are covered with paper during the day to prevent natural ventilation. At night the ventilating blower is turned on to force heat from the inside of the stack. The air is blown through a main duct and then out through lateral ducts throughout the pile. Sugar



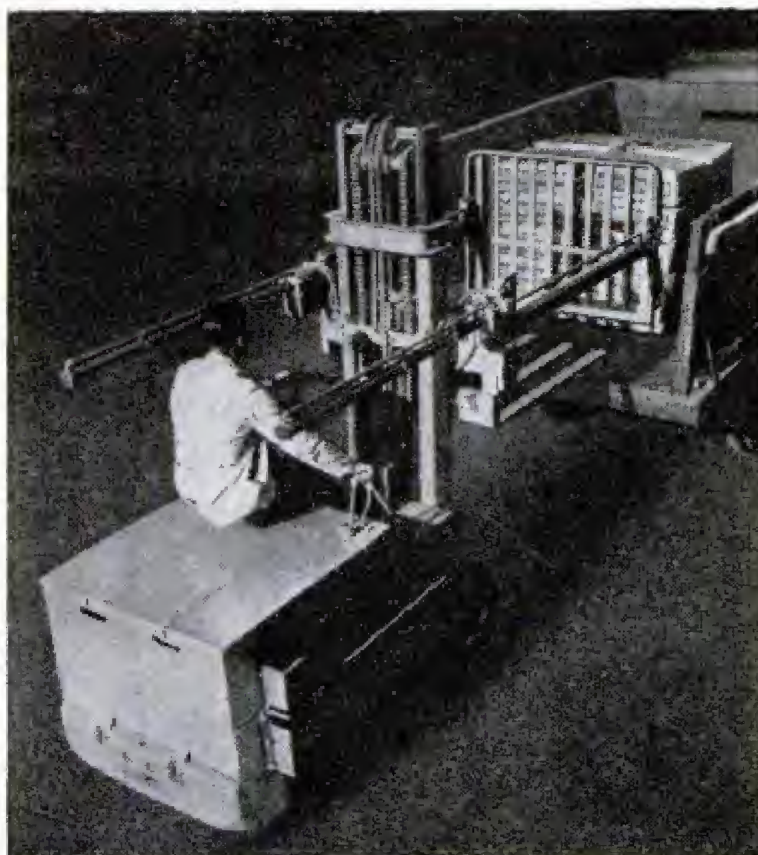
losses in the pile vary from one quarter pound to one pound per ton a day, depending upon the temperature. Respiration of living beet tissue burns this sugar to give off the heat.

Pusher Unloads Lift Truck Without Use of Pallets

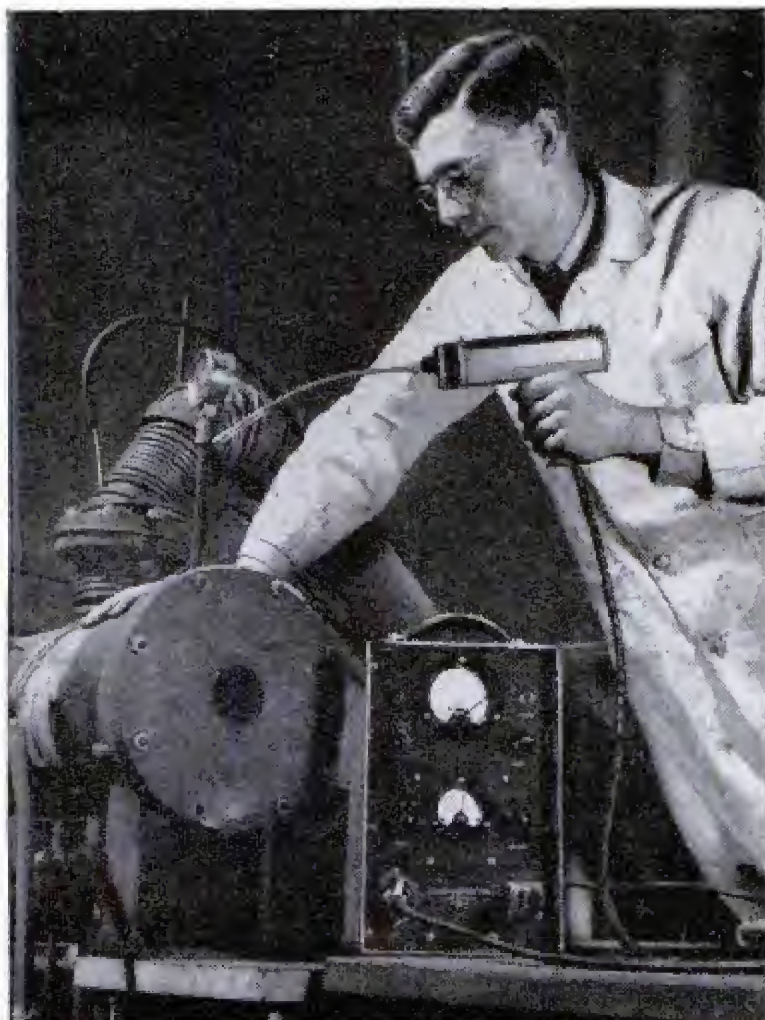
When a hydraulic pusher rack is installed on a lift truck, each load can be removed as a unit rather than piece by piece. The pusher assists in handling material in cartons and bags when the load must be removed from a pallet. Traveling horizontally to shove the load off the forks, the pusher rack is connected to two hydraulic cylinders which receive equal pressure. Maximum forward movement of the rack is 55½ inches. Multiple forks are used in handling loads without pallets.

Waste Pulp of Mexico Produces Valuable Wax

Brazilian carnauba wax, for years a basic ingredient of shoe and floor polishes, candles and waterproofing materials, now has a Mexican rival. The new wax, which has properties similar to those of carnauba, is extracted from the waste pulp left after processing of henequen or sisal rope fibers. It is hard, has a melting point of about 185 degrees Fahren-



heit and bleaches readily to an almost colorless material. Annual production of 10,000,000 pounds can be obtained from the sisal waste pulp on the Yucatan peninsula.



Electronic "Pistol" Detects Pipe Leaks

Extremely small leaks in boilers, tanks and pipes are detected by an electronic instrument that looks more like a large pistol than a testing device. When aimed at its target, the "gun" sucks in a stream of air. The air is analyzed and the amount of leakage shows on a metering device. Leakage of Freon, such as used in refrigerators, can be measured at a rate as low as one hundredth of an ounce a year. As the instrument, developed by General Electric, detects only compounds of chlorine, bromine, fluorine and iodine, these compounds are introduced as tracers into the system being tested.

Our WHERE-TO-FIND-IT INDEX, listing names and addresses of manufacturers and sources of further information for products and articles in this issue, is available free upon request. For your index, just write to Bureau of Information, Popular Mechanics Magazine, 200 East Ontario St., Chicago 11. Your letter will be answered promptly

SLAG

used to be useless

By William J. Duchaine

ONCE a wasted by-product of pig-iron production, slag has now become a hard-working member of the building-material family that pays its own way. For years huge piles of slag accumulated alongside blast furnaces—as useless as a boat on the desert. Blast-furnace operators couldn't give it away.

Today slag brokers are buying all they can get from iron and steel producers. Its new role as a building material has brought the once useless slag into the limelight, and even abandoned stockpiles on the sites of long-dismantled charcoal iron furnaces in Michigan are being bought up and turned into useful materials.

Mineral-wool insulation made from this slag is making many homes warmer in the winter and cooler in summer. Buildings are being constructed of lightweight blocks made of slag and cement. These slag-concrete blocks, much lighter than concrete blocks made with gravel aggregate, can be cut, drilled and nailed almost as easily as wood. Yet the porous blocks are fireproof

and have a high insulation and sound-absorption value.

Slag is drawn from the furnaces during the production of pig iron. The modern blast furnace is a hollow cylinder of steel plate about 100 to 125 feet high, lined with heat-resisting brick. Raw materials—limestone, iron ore and coke—are fed into the top of the furnace and intensely hot blasts of air are forced into the mixture through an opening near the base. The molten slag and iron collect at the lower part of the furnace. The limestone acts as a flux in removing the impurities from the iron during the blast-furnace operation.

These impurities, being lighter than the molten iron, float on top of it forming the slag which is drawn off separately and poured into large slag thimbles mounted on railroad cars. When it cools, the slag solidifies and is crushed into small pieces. These pieces are passed over a magnetic pulley which removes those that contain an appreciable quantity of iron. Returned to the blast furnace, these pieces give up their

The once useless slag pours from the furnace into slag thimbles to start a trip that may end in your home



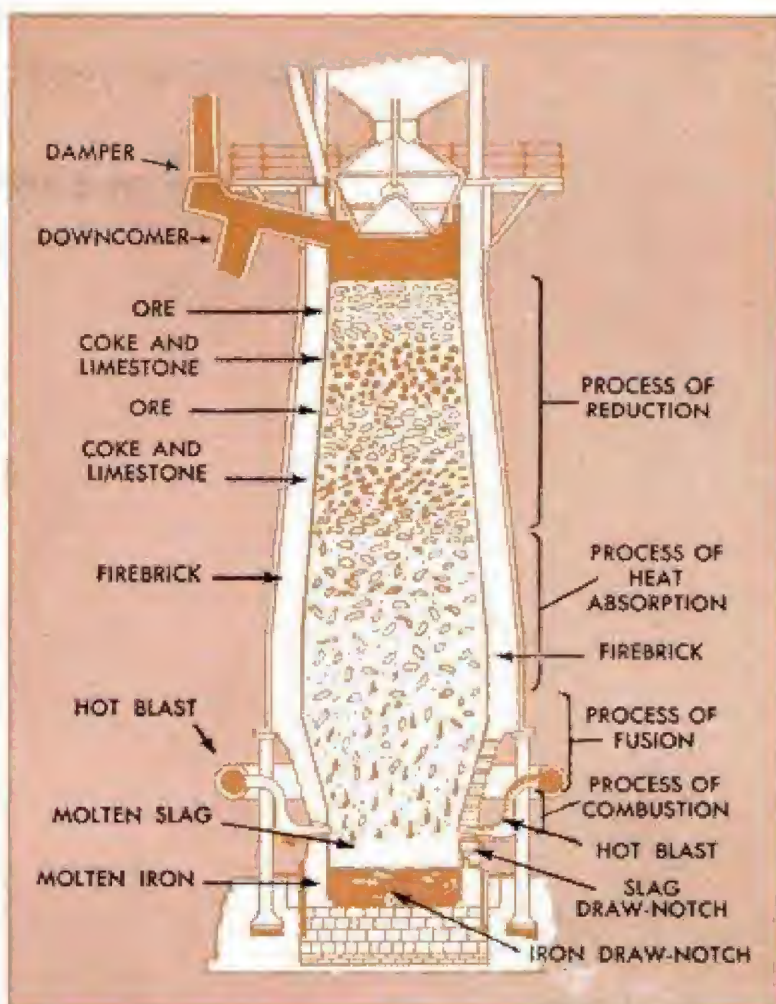
Mountains of the one-time waste product of the pig-iron furnaces are now being funneled into building blocks and home insulation

metal during the second heating.

Dissolved gases escape from the furnace with the molten slag. Some of this gas is trapped in bubbles inside the slag and as it cools it is honeycombed with tiny pores which expand its volume and decrease its weight. Some slag, which is used as a lightweight aggregate, is specially treated to increase the number of air pockets.

The crushed slag that does not contain enough iron to warrant remelting is then graded according to size by passage over a sieve having various-size openings. The larger pieces are used in the construction of highways and track roadbeds and as trickling filters. Smaller pieces are used for roofing and seal-coating of bituminous highways.

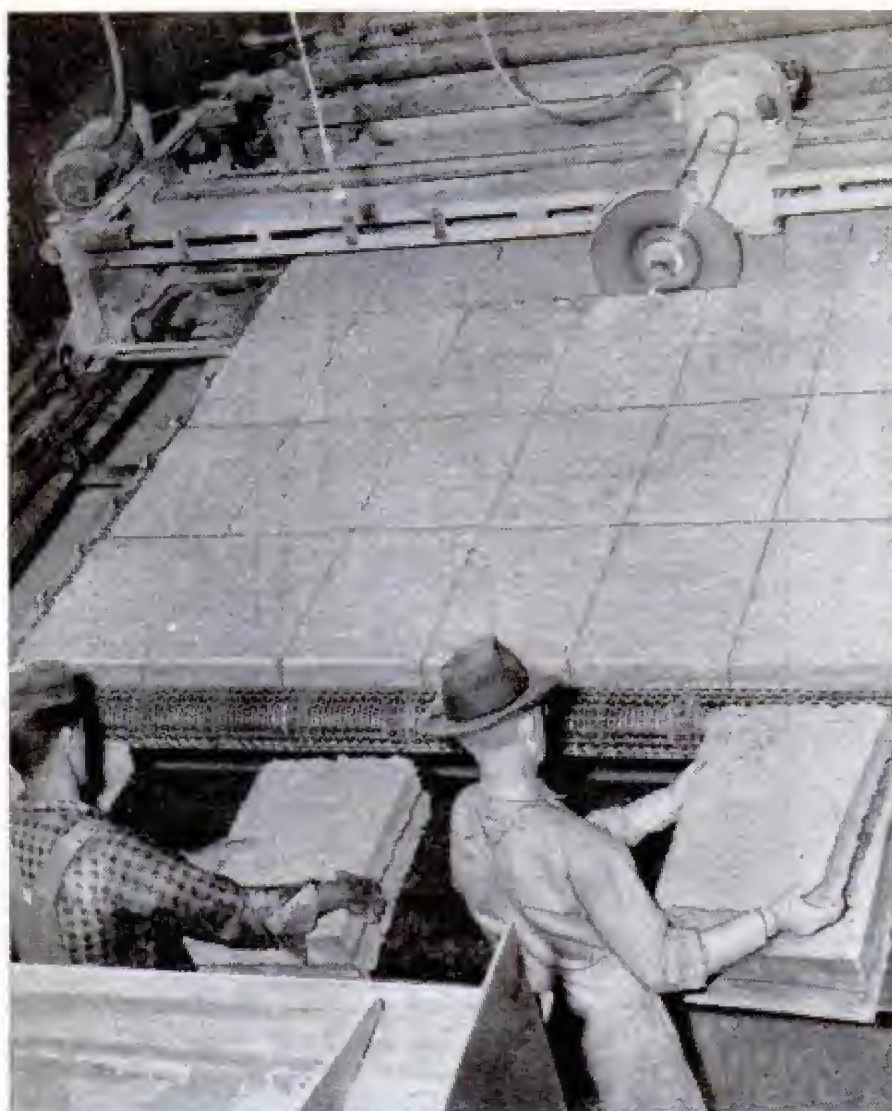
More than 16 million tons of this slag are used annually for



Diagrammatic cross-section drawing of a blast furnace in operation. Ore and other materials are dumped in at the top of the tall cylinder. Molten iron and slag are drawn off the bottom

After leaving the furnace, the slag goes to a dump where it is cooled before being hauled to the crusher





Mineral wool in batt form is cut to the desired sizes by an automatic crosscut saw. Here workers remove the finished batts from the conveyor

highways, track ballast and other construction projects. Our railroads alone are using $3\frac{1}{2}$ million tons every year to construct and maintain stable and well-drained roadbeds. Slag has also found wide usage in trickle filters at Army posts and in city sewage plants all over the country. Incidentally, the Siegfried and Maginot lines were built of reinforced slag concrete as was the German base at Helgoland.

Most of the mineral wool used for building insulation is made from slag by a pressure-blasting process. By this method, the Tennessee Products and Chemical Corporation of Nashville and Rockdale, Tenn., produces a mineral-wool insulation known as Tensulate.

The raw materials used in the manufacture of this product are slag, coke, river gravel, limestone and dolomite, the last three in small quantities to balance the slag chemically to produce a stable long-fiber wool. These raw materials are charged in melting furnaces or cupolas, which are steel shafts 20 to 30 feet high with an inside diameter of $4\frac{1}{2}$ feet. Six parts of slag are added to one part of coke by weight plus

small amounts of the other materials.

The slag is melted by the burning coke, oxygen being supplied by blowers which force air into 11 tuyeres near the bottom of the furnace. As the slag melts, it flows continuously through an opening at the bottom. The stream is divided into six or eight pencil-size streams by divider plates. At temperatures of 2600 to 2800 degrees Fahrenheit, these tiny streams of slag are blown with high-pressure steam from V-shaped nozzles. The blasts tear the streams into hundreds of small droplets which are propelled at great speed into a collection chamber.

This chamber is a long, narrow room, the floor of which is an endless conveyor. As the droplets are propelled into the chamber, they form fine, hairlike tails and are forced to the floor by a series of fans. There they become a thick tangled mass that is known as "loose wool."

For use in insulating building sidewalls and attics by hand placement, the loose wool is packed, without further processing, in 40-pound bags as the conveyor carries it from the chamber.

Another form of mineral wool, known as pellet wool, is used for insulating buildings by blowing it through pipes under pressure into the building cavities. To produce this variety, annealing oils and water-proofing material are introduced into the collection chamber. The mineral wool which forms is carried by conveyor to a hammer mill or granulator where it is shredded into small pieces. From there it goes to a rotary screen where the droplets that did not completely turn into tail are screened from the fibers. During the screening process, the pieces of wool are rolled into balls or pellets.

If batts or blankets of mineral wool are desired, a binder material, usually a mixture of synthetic resins, is introduced in front of each steam jet, coating each fiber with resin. The speed of the conveyor belt is precisely controlled to build up a blanket of the desired thickness. As the wool leaves the collecting chamber, it passes under a

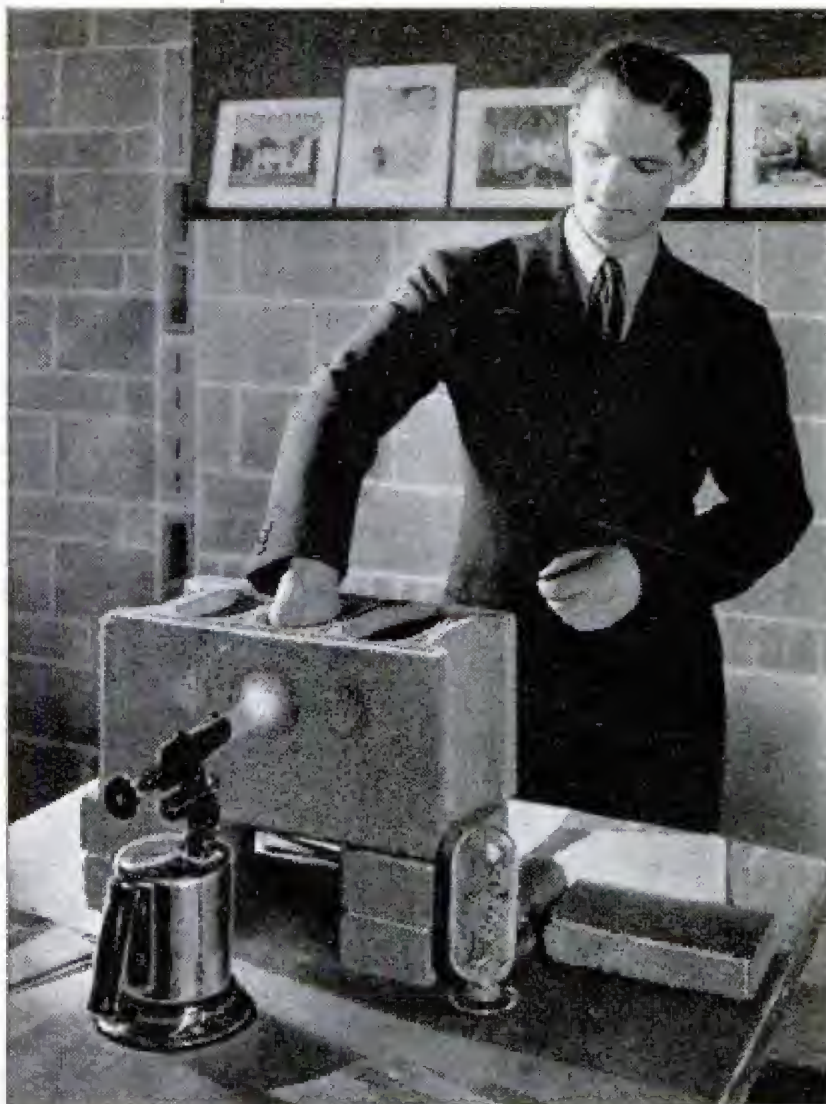
roller into a forced convection-draft curing oven where the temperature is maintained at 400 degrees Fahrenheit.

When the binder material has been set by the passage of hot air through the wool, the blanket passes over a section where cool air is forced through it to cool it so that it can be handled. It is then ripped to the desired widths by a series of saws and passed over a steam roller where a vapor paper is applied with an asphaltic adhesive. After they have been cut to the desired lengths by crosscut saws, the batts are compressed and packaged for shipment.

There is also another process which produces specially shaped blankets for industrial use and there are facilities for applying metal backing to the blankets to make heavy-duty, high-temperature insulation.

Another important slag product is the Celocrete building block produced by the Celotex Corporation. By a special process, the molten slag is converted into a hard, cellular, annealed mass, which, when crushed and graded for size, is ready to use with portland cement and water to

(Continued to page 242)



Above, Celocrete units made of slag-concrete are fireproof and have excellent insulating qualities as this photograph proves. Below, a modern one-story home near Cleveland built with blocks of Celocrete





Magnet-Driven Cars Race on Tiny Oval

Thrills and spills aplenty are enjoyed in the living room with a miniature auto speedway that uses motorless cars. The tiny racers are pulled around an aluminum track by strong magnets riding on rails be-

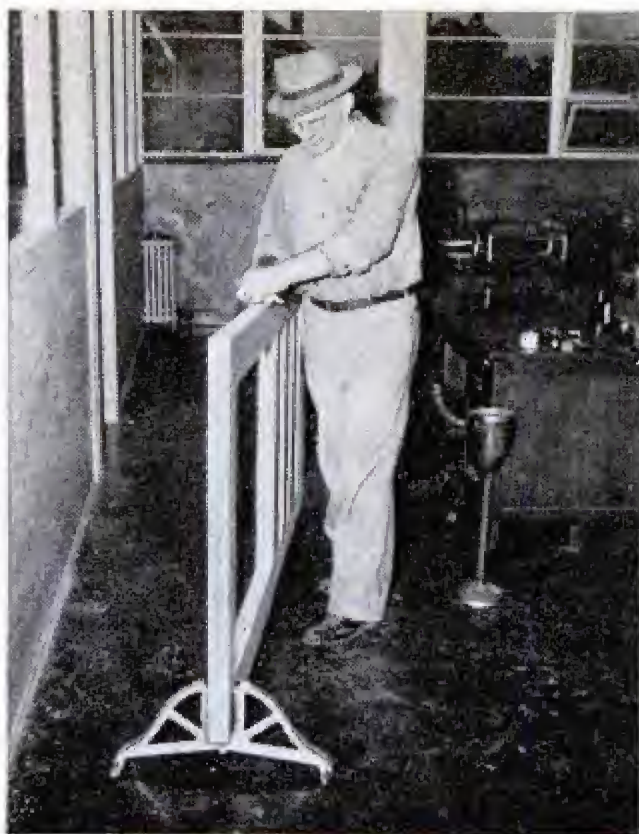
neath the oval. The magnets attract the front axles of the scale models and speed is controlled by knobs on the sides of the track. Speeds up to seven miles an hour, the equivalent of 160 miles an hour for full-size cars, are possible. Running the cars too fast on curves causes spills as centrifugal force overcomes pull of the magnets.



Two-Way Plow Cuts Ditches

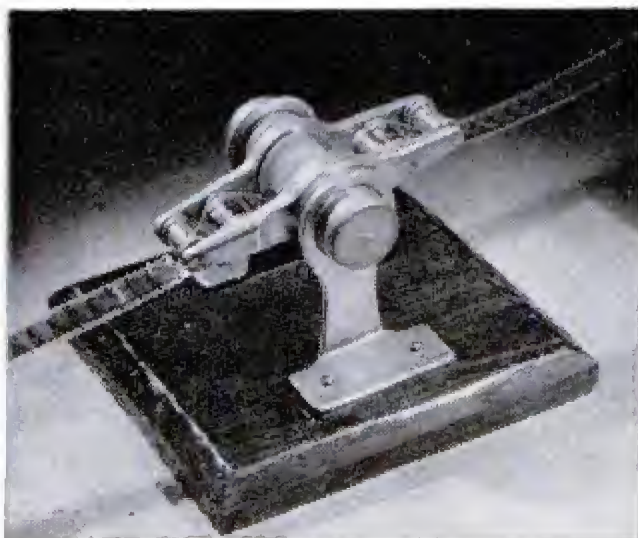
With a lift-type, two-way plow, the farmer can use both plows at the same time as a V-plow for forming irrigation and drainage ditches. In normal field plowing, each blade is used alternately to turn every furrow the same way, leaving no dead furrows. For contour and hillside work, every furrow is turned uphill forming a miniature terrace to hold moisture and resist washing. The two-way plow is raised and lowered by hydraulic control. When one plow is raised, the other automatically locks into plowing position.

Claim to the world's helicopter speed record has been made by a British pilot who flew a Fairey Gyrodyne at 124.3 miles an hour over an official three-kilometer course in a speed trial.



Vise Cradles Doors for Finishing

Doors and windows are held for finishing operations before hanging by a vise that grips the floor. The vise, made of aluminum, cradles the work between rubber contact points to prevent marring the surface. It is adjustable from $\frac{3}{4}$ inch to 3 inches and weighs only $2\frac{3}{4}$ pounds.



Movie-Film Waxer

Smoother running of movie film through a projector is assured when the sprocket areas of the film are coated with wax. A film waxer for home projectionists waxes either 8-mm. or 16-mm. film. As the film is reeled through the unit, two paraffin lenses apply wax to the margins of the film to assure free travel through the aperture gate of the projector.



Telescoping Fish Pole of Aluminum

Four feet long when retracted for convenient packing en route to the lake, an aluminum fish pole telescopes out to a length of 14 feet. Each section is made rigid by a half turn of the rod. The light, strong aluminum has a whipping action. The grip is of rubber, and there is a device for winding the line.

¶Hotels and motor courts in 47 states which accommodate travelers accompanied by their dogs are listed in a national directory just published.



The Hardgrave family gazes across the fields of the new farm, rebuilt between sunup and sundown. Right, 54 tractors clawed the earth to make the model farm

By Vivien B. Kentley

BULLDOZERS and earthmovers, ditch-diggers and mixers—all kinds of mechanical monsters rumbled up to the gate of an Arizona farm not long ago. Between sunup and sundown they face-lifted the fields, changed the channel of a river, built a pond and so completely altered the appearance of the farm that even its owner scarcely recognized his land.

The one-day demonstration showed 4000 visitors the methods by which a neglected and badly eroded farm can be restored to full productivity. Machines chugged through their chores to demonstrate nearly every known conservation practice in



They Rebuilt a Farm

rebuilding the farm from the river's edge to the crest of the 35 sloping acres. If Robert Hardgrave, the owner, had contracted to have the job done at prevailing wages and material prices it would have cost him well over \$7500. At day's end he had a new farm for nothing. If Hardgrave had attempted to do the job himself in his spare time he probably would have finished about 1968. With the last chore done, the last tractor waddled off the field at sundown to end the demonstration.

The Mizpah Ranch, bought by Hardgrave, an ex-GI, last October, was chosen by three cooperating Conservation Districts for the one-day demonstration. The Verde River, which irrigates the area, had already eaten away 12 of the best acres of

the farm. Fields were badly eroded and almost nonproductive. The sloping acres represented a big irrigation problem. The pumping system was inoperative. Topsoil was washing away.

An estimated quarter of a million dollars worth of farm equipment, from a garden tractor to a huge land-leveler, showed up to rebuild the farm, turning the demonstration into an equipment show.

The most challenging projects offered by the farm were stream-control measures, leveling about 25 acres, bench-terracing nearly 10 acres, and enlarging a shallow pond to a reservoir holding four acre-feet of water, which soon will be stocked with bass and bluegills.

Mechanical muscles pushed, lifted and



in a Day

carried 12,000 cubic yards of dirt in rebuilding the farm. Machines clawed out irrigation ditches and then lined them or dropped concrete pipe into place. A new electric pump was installed. Neighbors and equipment demonstrators ran an irrigation system, including valves and a siphoning setup, to the irrigation ditches. Water for the house is piped in from an artesian well, so this was not affected by the men and machines.

But linemen ran electricity into the farm, including a heavy wire for Mrs. Hardgrave's new electric stove, replacing an old wood-burner. As a final gesture,

Veterans taking on-farm training survey the land and mark cut-and-fill stakes under Soil Service direction





Ditch-lining machine feeds ready-mixed concrete from barrel trucks into the sides and bottom of the ditch. Below, this is the scene 18 minutes after the ditch was started. About 600 feet have been lined with concrete.



painters swarmed over the house and barn to apply a free coat of paint so the buildings would look as new as the rest of the farm. At sundown Hardgrave looked across an unfamiliar farm, but one of the finest in northern Arizona.

One of the most expensive projects completed during the day was stream-bank protection. River damage can't be ignored or farm land may be washed away, leaving only a useless gravel bed or even a new river channel.

To protect the Mizpah Ranch river bank, large cables were stretched along the most critical bank areas and anchored to tremendous logs in deep T-shaped holes dug in the bank. Cedars were fastened to these cables to start debris barriers.

Below, nearer the river bank, nine-foot live-willow posts were set six feet apart deep in the ground (in holes dug by mechanical posthole diggers). These will root and grow. Staggered behind the willows are Russian olives. There now are hundreds of other trees, shrubs and vines. The useless part of the river bank has been converted into a wildlife area, where quail and other game birds thrive on berries. The best part of the gravel bank has been planted to panic grass, and will be useful pasture. Fencing has been strung along the willows, to keep cattle from the river out of the wildlife and pasture areas.

River-channel problems have to be solved jointly by everyone along a river, so only a minor straightening job was undertaken. Playing with river channels is a tricky business; undo the channel's damage to one farm and you're apt to pass it along to your neighbor across the river.

For the straightening job, a giant 180-horsepower bulldozer was used. Afterwards, this rugged piece of equipment

Mechanized buckscraper-carryall goes to work on one of the fields, leveling ground for future irrigation



Bulldozer scrapes out the earth for the 14-foot-deep pond that will serve as a water reservoir. Below, ditchdigger scoops up dirt with chain of buckets





Aluminum siphon tubes shift water from main channel to smaller ditches. They eliminate need for headgates, are inexpensive and primed by hand

dominated the pond excavation job. It averaged moving three cubic yards of dirt a minute all day long. After excavation the pond was lined with clay dug on the ranch and loaded into dump trucks donated by local contractors. River water now is pumped through concrete pipes into the bottom of the pond which is higher than the cultivated acres. The siphon system pushes the pond water into the irrigation ditches as needed.

Two big land-leveling outfits, one op-

erated by a local contractor and one brought in from Phoenix, 150 miles away, were used. Land-leveling and bench-terracing also were done by smaller tractors of almost every make. The tractors used buck scrapers, utility blades, carryalls, two-way and single and disk plows, lift-type disks and border disks, loaders and ditchdiggers. Before they were through, the earthmoving equipment, big and small, had treated every acre to be cultivated on the farm, either by leveling or terracing, bordering, plowing, deep cultivation or floating, and made it ready for irrigation. After irrigation it will be fertilized and then seeded.

An interesting sprinkling irrigation system was demonstrated on one field, but the permanent irrigation will be by ditches. The ditches were "laid" by two new rigs, a trencher and a ditch liner.

The trencher is a set of rotating teeth which loosens earth and lifts it to one side, digging a trench 14 to 18 inches wide up to a depth of 40 inches. By retracing, the width can, of course, be doubled. Its advantages over most ditchdigging equip-

Unlined irrigation ditches are sprayed with heavy oil which forms a crust to prevent ditch-bank erosion



ment are its motive power—either one of two makes of tractor—and the fact that it costs less than \$2000, or about half the price of a heavy-duty trencher. Its modest cost and simple operation make it a natural for golf-course irrigation systems, small-community or privately owned water and sewer systems, construction foundations and similar uses as well as on farms.

The obvious favorite of the "sidewalk superintendents" was a new combined digger and concrete form. The equipment comes in a three-piece set; there's a pull grader that prepares the ground on the ditch alignment; a special plow to cut the ditch to a true cross section, line and grade, at the same time forming a berm or shoulder; and a slip form that pours fast-drying, premixed concrete to a true section, line and grade. A mixer truck moves alongside the slip form which, like the pull grader and plow, is pulled by any ordinary tractor. The concrete-mixer truck and tractor move in unison; the truck discharges its concrete into the hopper of the slip form. Every five minutes they leave behind them 240 linear feet of concrete-lined and completed ditch! Depending on soil conditions and the thickness of the concrete poured (up to 1½ inches thick), the equipment digs a ditch and lines it with concrete for from 55 to 75 cents a linear foot.

(Continued to page 256)

Top, front-wheel-drive garden tractor plows the earth for Hardgrave's garden. Right, clay is scooped from a deposit near the farm to line the water reservoir. Behemoths such as this land plane make short work of leveling heretofore nonirrigable 10-percent slope



Dealers: Boyd Ten y
Feed stores
Prescott, Arizona

Ride master Garden tractor
Food Machinery Corp.
San Jose, California

Mtr.

A Century of Railroads



Old-fashioned train runs length of fairground. Below, mockup of Chesapeake & Ohio's projected Train X is low-slung for stability



Below, fairgoers are given a track's-eye view of a modern sleeping car. Mounted upside down, the complete underframe is exposed and explained. Engine behind it was captured from the Germans by the U.S. Army. Right, chromed rails form this revolving column



OLD AND NEW fashions in American railroads are on exhibit at Chicago's lake front in a Railroad Fair celebrating 100 years of railroading in the Middle West. Pioneer locomotives with steam up run alongside the newest steam and Diesel-electric trains, while some cars yet unbuilt are shown in mockup form.

Marking the 100th anniversary of the first run of a steam locomotive from Chicago, then a muddy frontier outpost, the Fair has assembled millions of dollars worth of rolling stock to dramatize the progress of the century.

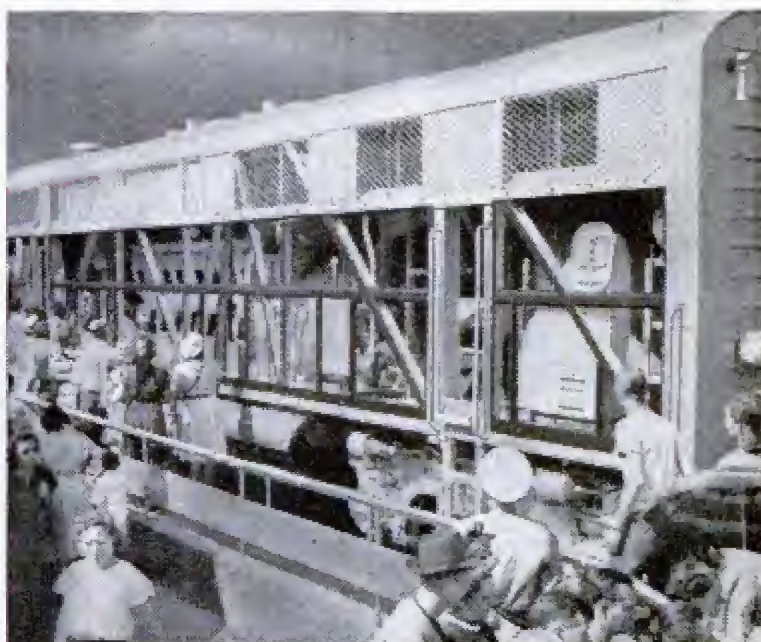
Thirty-eight of the nation's railroads proudly strut their stuff. In an outdoor pageant real locomotives puff on and off the giant stage under their own power. A rodeo, an Indian village, a small-sized reproduction of Old Faithful that really spouts and scores of other features make the Chicago Fair the end of the line for rail fans.



on Parade



Above, centerpiece of the Fair is the wood-burning "General" which played an exciting role in the Civil War. Captured by Union soldiers, it was pursued and overtaken by Confederate railroaders in a 100-mile race from Big Shanty, Ga., to the Tennessee border. Left, a favorite with youngsters, a 9-foot foam-rubber robot, dressed like an engineer, carries on conversations and acts almost human. It is controlled remotely by an operator hidden behind a one-way glass in wall. Below, this powerful Diesel holds no secrets! Side panels, housing and machinery covers have been cut away to give fairgoers a view of the flow of power in the 1500-horsepower locomotive





"Splashketball"

Among the latest sports in swimming pools is "splashketball," a rough-and-tumble game that combines water polo with basketball. Teams of four men each attempt by swimming, jumping and splashing to put the ball through a movable basket. The basket is attached to the goalie by a life preserver, and goalies are allowed to move anywhere in the pool. Excitement comes when a player attempts to make a basket while the goalie tries to avoid him. The players wear caps to identify their teammates.

Safety Light Socket Ends Shock Hazard

Accidental shocks are impossible with a safety socket that is not "live" until a bulb is screwed tightly in place. A strong spring holds the center contact away from the current-carrying lead. No amount of finger pressure on the center contact will complete the circuit. When the bulb is screwed into the socket, the threaded shell is forced upward and current flows into the bulb. Whether the switch is on or off, the disconnect feature prevents accidental shock to curious children or careless adults.

Although it did not kill them, the atom-bomb rays unleashed at Bikini affected grains of seed corn exposed on the ships during the blast so that they produced plants that were abnormal.



Kit Converts Ordinary Garage Doors For Overhead Opening

Ordinary garage doors of the hinged type can be converted to the overhead lift variety by means of a set of easily installed hardware. Angle irons join the two doors to form a solid unit. Less than one inch

clearance between the top of the door and the ceiling is required. The hardware set includes all necessary fittings to mount either one-piece doors or converted double doors for lift opening.

Inventions Screened Here

By Ewart Thomas

WANTED: A practical method of detecting underground oil deposits.

WANTED: A better way of drilling oil wells, especially through hard formations.

WANTED: A small economical air conditioner, a better storage battery, a cheap way of distilling sea water.

If you have any practical ideas on these subjects, the Institute of Inventive Research of San Antonio would like to do business with you. These are tough projects and many brilliant minds have pondered over them without much success.

Your ideas should be workable, better than present methods and relatively inexpensive. Otherwise, don't waste your time. Of 1400 ideas and inventions along many different lines that were submitted to the institute in the last 18 months only 12 were considered good enough for development.

One of the few successful ideas was an improved "bump"



Airplane mechanic submitted an idea for a tire-change tool. Result is this hydraulic machine that removes the tire in quick time

Attractive homes house the staff. Slick believes that men work better in fine surroundings so he built the institute on a ranch





Staff member delves into the problem of developing a high-intensity ignition system for combustion engines that will operate on a vacuum tube. Coin-operated bottle opener is one of the institute's developments. It foils the customer who helps himself to a soft drink but forgets to pay



gate, a gate that is cattle-proof and that automatically swings open when bumped by an automobile. It stays open long enough for the car to pass through and then closes and latches itself. Cattle can't get through and the driver doesn't have to get out of his car to open and then close the gate.

The bump gate had plenty of bugs when it was submitted by its originator. It worked after a fashion, but it wasn't positive. The institute devised a heavy spring leaf that is attached to the bumping plate and that stores up energy enough to unlock the gate and then swing it open. This is one of the gate's most valuable features. Just out of the test stage in which it was bumped thousands of times by automobiles, the gate soon will be on the market. Orders have already piled up from cattlemen who have seen it. The original inventor and the institute will share all royalties.

What is this Institute of Inventive Research?

It's an organization created to help the man who invents a practical device and who hasn't the facilities or finances to develop and market the idea by himself. The institute is one of three companion organizations that have been set up by Thomas B. Slick, Texas oilman and rancher, to do research that will help the Southwest and, in a broader sense, that will be of benefit to everyone.

Thirty-two-year-old Tom Slick has big imaginative ideas and the money to back them up. A Phi Beta Kappa in science, he has always wished for enough leisure personally to go to work on some of the problems

that intrigued him. Other interests always kept him too busy. As an alternative he decided several years ago to assemble groups of research men who could devote all their time to scientific questions.

He backed up this thought with an endowment of a million dollars worth of property and securities. Then he established the Foundation of Applied Research, the Institute of Inventive Research, and the Southwest Research Institute, all nonprofit organizations.

These are imposing names and somewhat confusing, but each organization has its own field of work. Each is young, healthy and busy.

The Foundation of Applied Research has the task of conducting long-range fundamental research in various sciences, particularly in biology and medicine. It operates on grants and gifts.

The Institute of Inventive Research, organized last year, offers a development service to inventors without any fees or preliminary charges. If an invention is developed and marketed successfully, the institute shares in royalties. This helps support the Foundation of Applied Research.

Southwest Research Institute, also recently organized, does research jobs for industry. It is patterned after the famed Mellon, Armour, and Battelle groups and has a backlog of \$50,000 worth of orders for studies. Fees cover costs alone, without profit.

Each of the groups is governed by a board of trustees consisting of public-spirited citizens of the region. Staff scientists and research workers have been carefully selected and at present about 50 people are on the payrolls.

One of Tom Slick's ideas is that men can work best in the proper surroundings. Instead of cramped laboratories in the industrial portion of a city, he visualized a scientific headquarters in the country, remote from city atmosphere. Accordingly, he bought 3500 acres of rolling land, about



In the petroleum lab is an emergency shower. In case of explosion or fire, worker pulls handle to flood water completely over his body



Institute obtained a patent for the inventor of this combination salt-and-pepper shaker. Moving the lever closes one set of holes. Lawn sprinkler successfully developed can be set to spray only at the desired angle so that sidewalks and houses nearby won't get wet





Puller attachment for a tractor jacks brush and trees out of the ground. Main roots come out, too

buildings adjacent to the ranch is now under construction. Those already completed are occupied by the offices, laboratories and shops required for research. All equipment needed by the staffs has been provided, from glass-blowing apparatus and laboratory animals to electrical test equipment and complete lines of both wood and metal-working power tools.

Beautiful rambling residences have been built for some of the staff scientists and others are to be started soon. Cable House, an early-day mansion around which some of the buildings are grouped, has been renovated and serves as a guest lodge for distinguished visitors. A swimming pool and other recreational facilities are to be built.

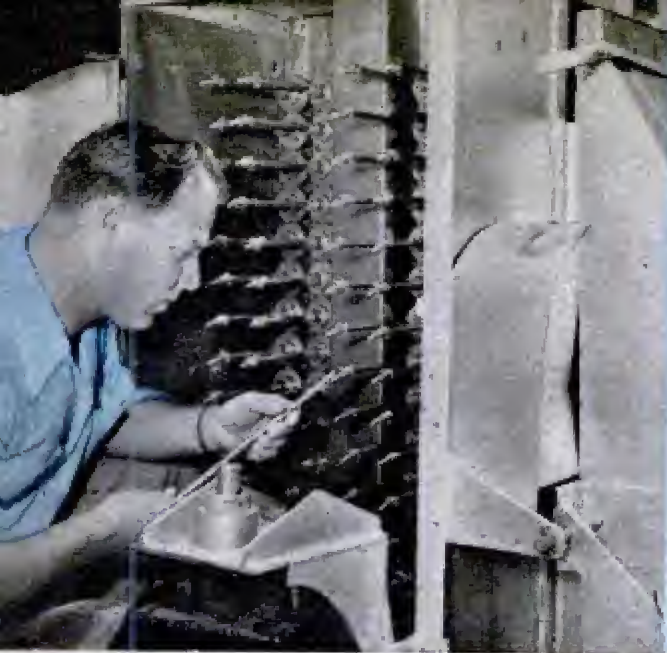
eight miles west of San Antonio, and started the Essar Ranch, the name consisting of the phonetic initials of the words "Scientific Research." The ranch is a going concern, has prize-winning herds of Hereford, Angus and cross-bred cattle, and is used as a field laboratory by the research groups.

A cluster of modern one-story brick

Development work already performed at this center includes perfection of the bump gate as well as the engineering and building of working models of various other inventions. One of these is a small cotton-

White Brahma bull is bred with other types on the ranch to produce a superior animal that resists disease





Dry cotton picker shown at right has barbed picks that rotate and move back and forth to pick up the cotton

picking machine that can be attached to almost any tractor and has the advantage of picking the cotton dry, without the use of water, which is objectionable to cotton-gin operators. The picker harvests rows as cleanly as do the large mechanical pickers and costs about half as much.

Another invention developed at the center is a nonoverflow nozzle for use on the gasoline lines of filling stations. Fuel is shut off automatically as soon as the level rises to the nozzle of the hose. Another idea that is now ready for market is a lawn sprinkler that can be adjusted to operate inside 90, 180 or 270-degree angles

as well as in a complete circle. The advantage, of course, is that the sprinkler can be set to water only one corner or portion of a lawn without wetting a nearby sidewalk or house.

The institute assisted a mechanic of Slick Airways in the development of an airplane-tire demounter with which one man can remove a large airplane tire from its wheel in a matter of minutes. Formerly it took a couple of men as long as several hours to do the job and often it was necessary to drive a tractor over the tire to break the bead free from the wheel.

(Continued to page 244)

Cattleproof gate automatically opens when bumped by a car, then closes after car has passed through





Plugs can be tailor-made to the angler's specifications with the carving kit, which includes all materials, a knife and paints

Fishermen Can Carve Casting Plugs With Materials From Kit

Anglers can carve their own casting plugs with a kit that contains all the necessary parts. The kit includes materials for making 8 to 10 plugs. Among the parts are

carving blocks, a two-blade knife, instruction sheets with photographs, hooks, fish eyes, screw eyes, sandpaper, brushes, undercoat enamel and six colors of paint.



Midget Bike Becomes Motorcycle

In an effort to build a vehicle similar to those used by English paratroops, 12-year-old John Molnar, Jr., of St. Louis, Mo., has converted a small bicycle into a miniature motorcycle. The youth bought a $\frac{3}{4}$ -horsepower motor for five dollars, installed a clutch and fastened it to his bicycle. Other expenses included seven dollars for welding and 75 cents for paint. Now he buzzes down the street at speeds up to 25 miles an hour.

Gas Turbine Powers Generator

Electricity for commercial use will be generated by a gas-turbine engine when an installation at Oklahoma City is completed. The engine, under construction by General Electric, is a duplicate of a 4800-horsepower gas turbine for a locomotive. Natural gas, plentiful in Oklahoma, will be used as the fuel. In the turbine, the gas will be mixed with air and burned, the resulting gases expanding against hundreds of vanes on a propeller shaft. The shaft will operate the electrical generator.

Our WHERE-TO-FIND-IT INDEX, listing names and addresses of manufacturers and sources of further information for products and articles in this issue, is available free upon request. This index is one of the many services offered to Popular Mechanics readers by the Bureau of Information. For your index, just write to the Bureau of Information, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11



Printing Rolled on Surface By Hand-Operated Marker

Packages and crates are marked with one motion of a printer that has its own ink supply. The device is rolled along the surface and prints on every stroke. The type can be changed when various messages are to be printed or, if this is unnecessary, a permanent die is used. Two-color impressions are made by using a different ink on each of the two inking rollers.

Machine Uses a Continuous Tape To Address 20 Letters a Minute

Printing addresses on envelopes by means of a continuous tape, a small addresser uses no awkward stencil or individual plate for each address. The addresses are typed on a master tape and a carbon copy is placed in the addresser. The printing is transferred to the envelopes in the same way a spirit duplicator operates. The tape will print each address about 100 times without retyping and addresses up to 20 envelopes a minute. Corrections can be made by pasting a slip over the old address.

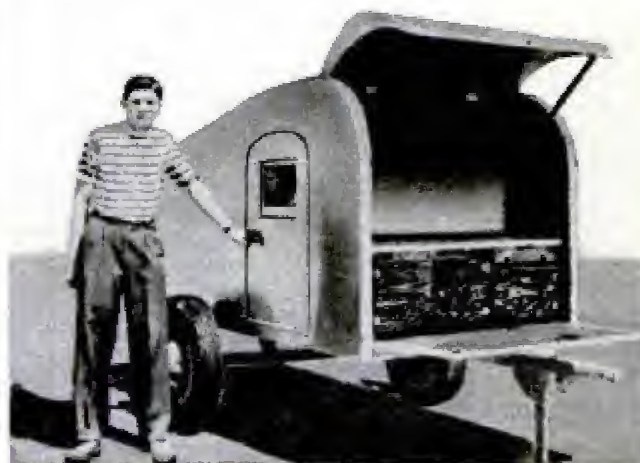


Replacement Parts for Airplanes Shipped Around World in Tin Cans

Even airplane mechanics now have to have a can opener in their tool kits. Small spare parts, after being coated with plastic and carefully wrapped, are sealed in metal cans to insure safe arrival at their destination. The cans are boxed and shipped to all parts of the world where they are used in servicing transport planes.

Youth Designs and Builds Trailer

Roomy enough to hold a full-length bed, a camping trailer built by a high-school student cost only \$184. Conrad Grimshaw of Beaver, Utah, designed the trailer and constructed it at school. A wooden cabinet beneath the bed compartment holds dishes, cooking utensils and camping equipment. The trailer can be entered through the front end, which is hinged to lift up, or through a miniature door in the side. The stand is a fixed stake which is snapped into place when the trailer is parked.





Making the traditional lighthouse structure unnecessary, these all-weather lamps emit four beams of light as they are rotated by a small electric motor

It will be a sad day, sentimentally, when the lighthouse keeper goes ashore and leaves his post in the heartless but efficient care of a mere robot. But that day is coming when the guardian of the light will visit his station only once a month

By Thomas E. Stimson, Jr.

STORM-SWEPT Tillamook Rock is one of the most desolate and dangerous light stations of the world.

A few miles off the mouth of the Columbia River, it is exposed to the full sweep of Pacific gales. Men and supplies can be hoisted onto the rock in fair weather but other times the station is half-smothered by roaring seas for weeks on end.

Its beacon is a good 133 feet above sea level and yet during one ugly storm a man was almost drowned while working in the room just under the light. A giant wave towered up, broke the glass windows at the top of the lighthouse and poured tons of water into the room below.

In another storm a huge rock that was swept up out of the sea crashed through the roof of the house where the keepers live, smashing the galley range to bits. The house is 100 feet above the sea and now its concrete roof is reinforced by a second protective slab.

Sometimes the keepers on Tillamook Rock wonder why robot mechanisms can't be built to take their places. Surely, they speculate, automatic machinery could be invented that would turn on and off the 75,000-candle-power light and operate the fog diaphones when necessary.

They are right and the answer is that many lonely and dangerous light stations eventually will be left untended except for periodic maintenance visits. Human keepers will be replaced by "thoughtful" machines that will operate the light, watch over it and make routine repairs. All the elements of a completely automatic lighthouse have been perfected.

A big robot lighthouse, in fact, is under construction now at Long Beach, Calif. Some of its equipment will operate automatically; some of the other devices will be controlled by radio from another lighthouse five miles away. It is to be the guinea pig for stations of the future. Only at monthly intervals will a supply boat visit the lighthouse to replenish fuel in its tanks.

Goodbye, Lighthouse Keeper!

At the same time the Coast Guard is also preparing to test an automatic lightship. The ship will be completely equipped with automatic navigational aids and is designed to function as dependably as it would with a human captain and crew on board.

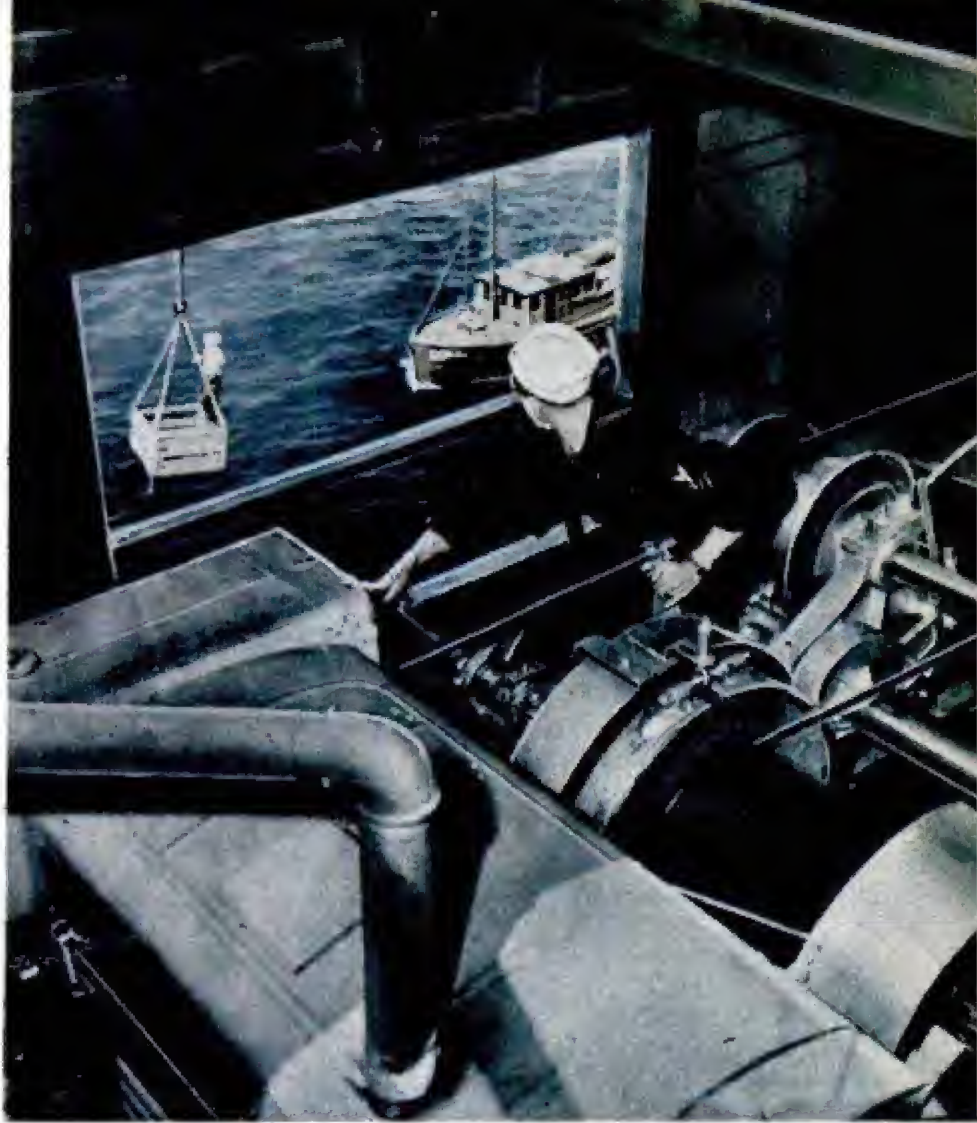
The Long Beach lighthouse is to consist of a reinforced concrete blockhouse and tower, 55 feet high, standing on top of stiltlike caissons. Heavy seas will sweep between these stilts without harm. Projecting above the lighthouse will be a 42½-foot steel tower that will serve as the antenna of the radio beacon.

Instead of having one of the traditional lamps the lighthouse will be equipped with a 140,000-candlepower all-weather rotating airway beacon mounted on its roof. Similar lights are in use now at a number of lighthouses.

The beacon will be controlled by an electrically wound astronomical time clock that mechanically computes the varying times of sunrise and sunset all through the year. If the lamp bulb burns out, it will be replaced automatically by a spare lamp that is mounted alongside it.

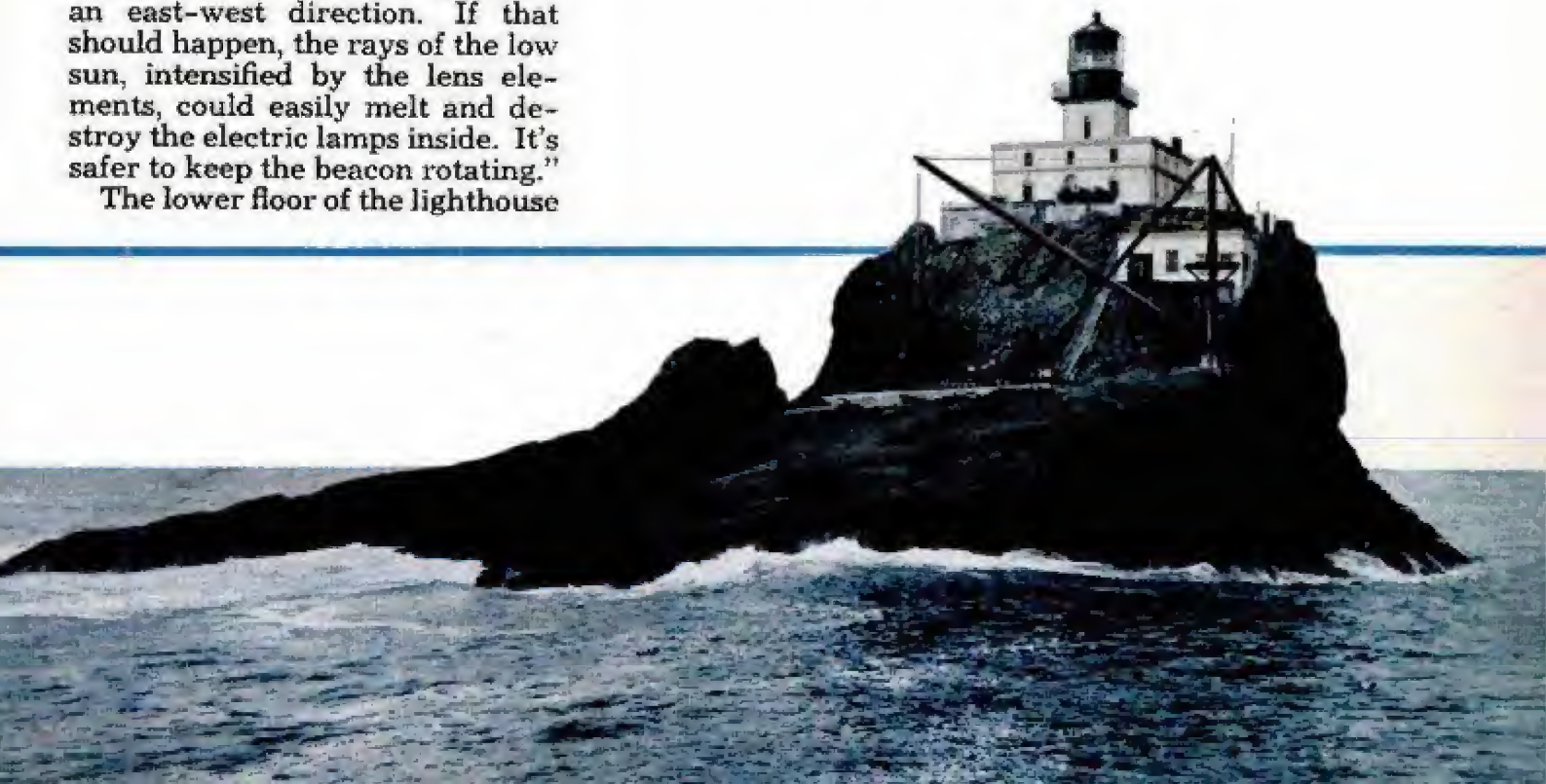
"The time clock will turn on the lamp a few minutes before sunset each evening and will shut it off again after sunrise the next morning," one of the Coast Guard engineers explains. "The beacon itself will continue to rotate night and day. This is to avoid any chance of the beacon coming to a stop in an east-west direction. If that should happen, the rays of the low sun, intensified by the lens elements, could easily melt and destroy the electric lamps inside. It's safer to keep the beacon rotating."

The lower floor of the lighthouse



Everything, from men to breakfast cereal, comes to this Puget Sound light in the basket being lowered to the supply cutter

In calm seas, Tillamook Rock looks like a good place to relax, but it's not relaxing when waves beat on the roof of the house





Combination lighthouse and airport beacon is mounted on top of tower at right of hangar. Below, adjusting astronomical clock that turns light on at sunset, off at sunrise. Sun relay at right does the same thing



There's more to lighthouse work than lights. Below, underwater area of bell buoy is sprayed with plastic



will contain two gasoline-driven generators, one of which will be in operation at all times. Automatic switches will shut down one generator and start the other at 12-hour intervals so as to alternate their use. The same switching arrangement will immediately start up the spare generator if the one in use happens to fail. Current from the generators operates the beacon and radio equipment.

Also on the lower floor will be two gasoline-driven air compressors, fuel tanks for a two-months' supply of gasoline and a large air-storage tank.

Two air-powered 17-inch Tyfon foghorns installed on the lighthouse will be controlled by radio from another lighthouse five miles away, using the new ANRAC circuit. ANRAC (Aids to Navigation, Radio Control) was developed during the war so that coastal aids to navigation could be turned off except when a friendly ship had need of them. A radio impulse from the ship would turn on the beacon or foghorn, then turn it off again after the ship had obtained its bearings. Recently ANRAC has become a standard method of remote control. One of the lighthouses on the Puget Sound, for instance, uses ANRAC circuits to operate a foghorn at a distant point where no keepers are stationed.

The Long Beach robot will also have an FM radiophone transmitter that will automatically turn itself on each time ANRAC puts its foghorns into operation. The keepers at the mother lighthouse will use an FM receiver to listen in and make sure the robot foghorn is actually operating.

One of the problems in designing the

robot structure was to supply electricity to the obstruction lights on top of the radio-beacon tower. The tower acts as an antenna and hence must have no connection to the ground, such as would be supplied by wiring to the lights. The solution was to use a transformer with an air gap to conduct the current up into the tower. The transformer conveys the electricity as desired but its air gap serves to insulate the tower from the ground.

More than a year of planning and testing was devoted to the ideas used in the robot lighthouse before construction started. Among those concerned with the design are Commander E. W. Laird, chief, civil engineering section, 11th Coast Guard District; C. N. Coseboom, senior civil engineer, and John T. Hendrix, chief electrician.

Sometime in the future the new lighthouse may also be furnished with a group of radar reflectors. These reflectors would create a bright spot on the viewing scope of a ship's radar and help the navigator to pinpoint the location of the lighthouse. RACON, too, may also be installed later. This is a radar beacon that transmits its own coded signal whenever it is triggered by radio signals from an aircraft or surface ship. Signals from an ordinary radio beacon provide a bearing but no indication of distance. RACON does both.

Robot lighthouses may seem like a brand-new idea, but the fact is that a large percentage of all aids to navigation are automatic. There are hundreds of untended

Top, coastguardsman inspects long-lived batteries of untended harbor beacon. Right, most lighthouses still have this old type of lamp which is rotated by clock weights. Below, in calm waters bell buoys are sounded by an electric piston that strikes bell





Above, windmills may be used to charge batteries of untended lights. Below, automatic bulb-changer unit



minor lights in harbors and inland waters that flash on and off all through the night and day. The lights consume such small amounts of current that their large marine-type batteries are good for a year without recharging. A rotating carriage into which four bulbs are fitted brings a new bulb into position automatically if the one in use burns out.

Stronger harbor lights that consume larger amounts of power are controlled by time clocks or by sun relays that turn the light on and off at dusk and dawn. The Coast Guard is experimenting with wind-driven battery chargers with the idea of attaching them to small untended lights on shore.

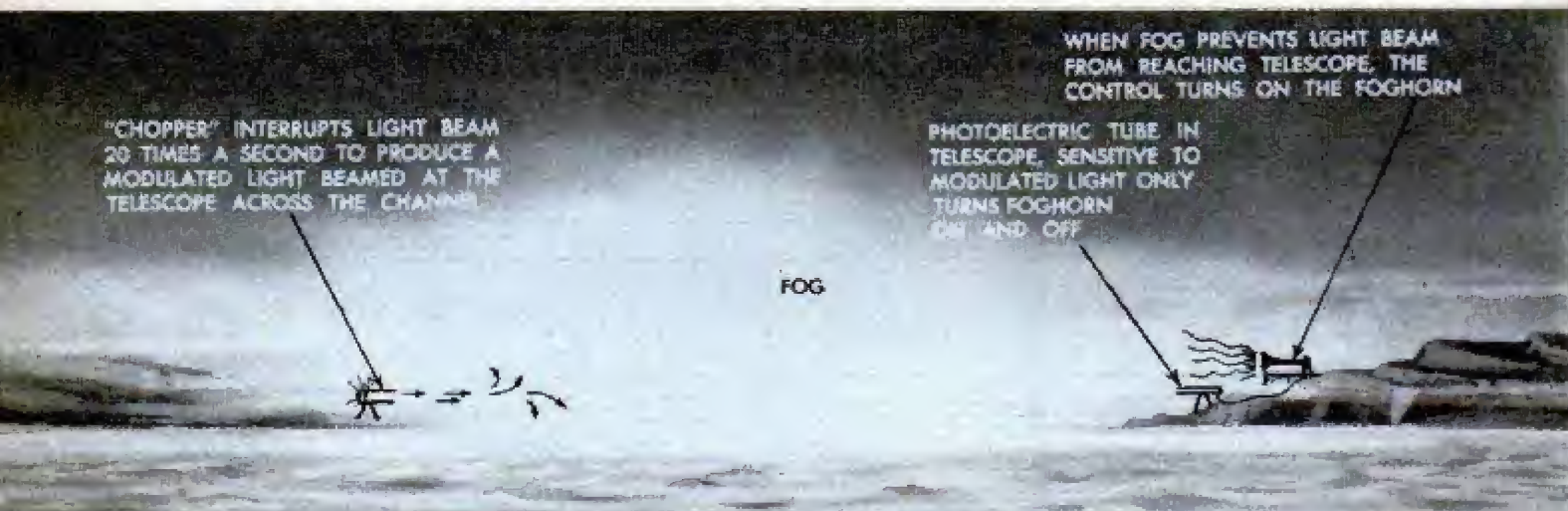
One novel type of automatic apparatus is the mechanical clapper or striker that is used on bell buoys that are planted in quiet water. A bell buoy in rough water can be depended upon to toll almost continuously, but in quiet water there may not be enough roll to operate the clapper. Buoys in these locations are fitted with a piston that slams against the bell at regular intervals. Some of the piston strikers are electrically operated; others are driven by bottled carbon-dioxide gas.

One perplexing problem has been to cause an untended foghorn to operate whenever fog settles in its vicinity. An apparatus that measures the amount of light was not the answer; what had to be developed was a way of measuring the transmissibility of the atmosphere. An apparatus that does this consists of a beam of modulated light from a source some distance away, as across a channel of water, plus a receiving apparatus that is sensitive only to the modulated light.

Successful experimental installations of the device employ the beam from a 25-watt bulb inside a high-intensity range lantern as the light source. The beam is broken up into a series of flickers by means of a "chopper" apparatus.

The receiving apparatus is adjacent to

Below, when fog interrupts the modulated light rays, the automatic control starts the foghorn operating



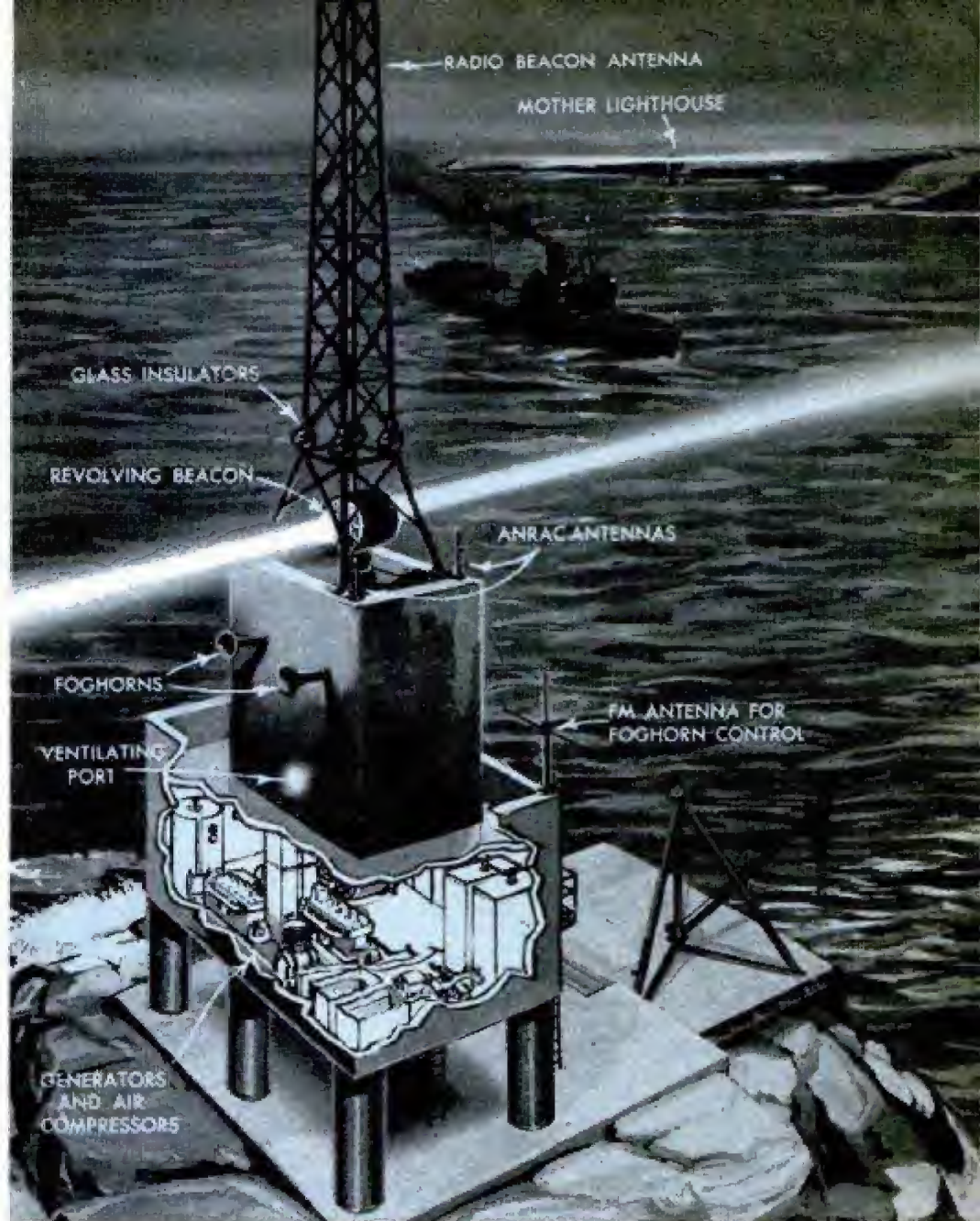
the foghorn and consists of a telescope containing a scanner and a photoelectric cell at the eyepiece end. This is connected to a cam type of timer and the timer is periodically reset as long as modulated light continues to be received. If the light diminishes, the cam rotates until it closes contacts that start the fog signal. The fog signal continues to sound until the atmosphere clears, allowing a flash to be received that stops the foghorn.

A time delay allows such an object as a ship to pass through the beam without starting the foghorn. The receiving apparatus is sensitive only to modulated light and is not affected by sunlight or a searchlight beam.

Foghorns along the coasts have had to be replaced in recent years by larger horns of increased range and intensity because modern ships are larger and travel faster and often are powered by noisy Diesel engines. But the loud, constant sounding of foghorns in periods of low visibility brings strenuous objections from people who live within hearing range.

Still in the experimental stage is a sound-control unit that should satisfy everyone. The foghorn remains mute until a nearby ship blows a sustained blast from its navigation whistle. The blast is picked up by the foghorn which acts as a microphone setting off a relay that starts the horn blowing. It sounds its own characteristic signal over a period of several minutes and then shuts off again. In time, sound-control units may control all foghorns located near built-up areas.

Veteran lighthouse keepers who entered the service when the new-fangled oil-vapor lamps were the very latest thing are wondering what will come next.



Top, drawing of the robot lighthouse that has no crew except radio. It is controlled by a mother lighthouse on shore. Right, siren type of foghorn



Miniature Racer Zips Track at 124 Miles an Hour

Flashing around a miniature track, a tiny racing car recently set a world speed record of 123.98 miles an hour. The car is a new model, manufactured and sold complete except for the engine. The bottom pan is a one-piece aluminum casting and the racer has an over-all length of almost 16 inches, a wheelbase of $10\frac{1}{2}$ inches and a tread of $6\frac{1}{8}$ inches. The top, which is detachable to expose the engine, is made of plastic. Both

the rear axle and the front wheels are mounted on ball bearings, with rubber cushions acting as shock absorbers. Equipment with the car includes a fuel tank, coil mount, battery container and ignition switch. Miniature racing cars usually are started by pushing them down the track. They may be raced either on a cable which pivots in the center of the track or on special rails to which they are attached.



House Numerals Trimmed in Hedge

When Leslie Stephens of Cleburne, Texas, needed a new set of numbers for his house he made a big set that is growing even larger. Stephens trimmed a privet hedge in front of the house so the numbers stand out in relief.

☐ Extending from Mount McKinley in Alaska to the Argentine-Chile border, the 10,000-mile Trail of the Americas is the longest continuous foot trail in the world.



Resembling U. S. cars, the Italian Alfa Romeo convertible has top speed of 100 m.p.h. It costs \$7000



French Renault (above and below) has four-cylinder engine in rear; carries four persons, and costs \$1264



Above, Holland's first postwar car, the Gatso, has a plastic top and duralumin body. It is built mostly of Ford parts including engine. The price—\$4200

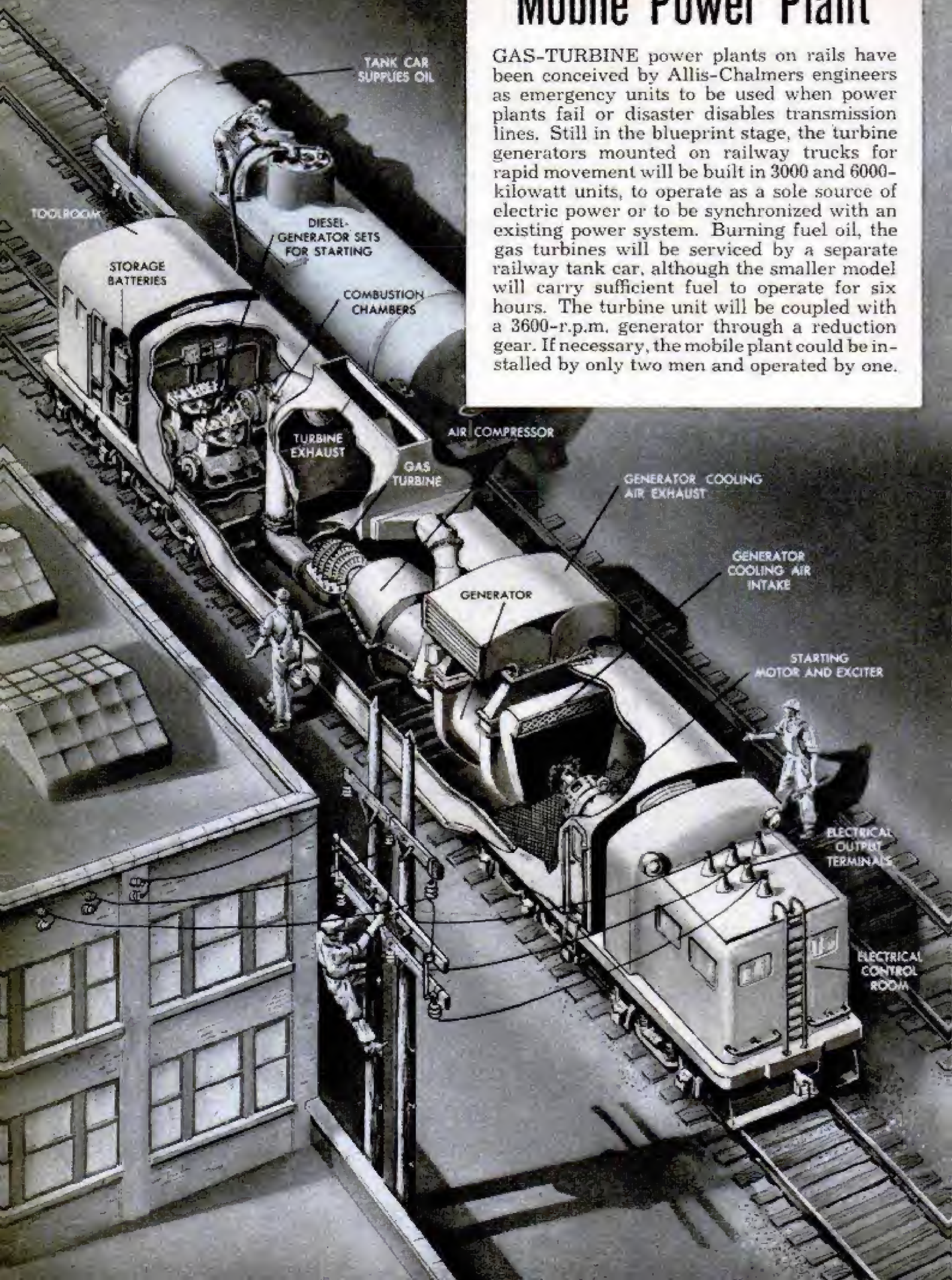
EUROPEAN CARS

Italian-built Fiat (below) is said to run 26 miles on a gallon of gasoline. Top speed is 81 m.p.h. and the price is \$3833. Note absence of chrome on body



Mobile Power Plant

GAS-TURBINE power plants on rails have been conceived by Allis-Chalmers engineers as emergency units to be used when power plants fail or disaster disables transmission lines. Still in the blueprint stage, the turbine generators mounted on railway trucks for rapid movement will be built in 3000 and 6000-kilowatt units, to operate as a sole source of electric power or to be synchronized with an existing power system. Burning fuel oil, the gas turbines will be serviced by a separate railway tank car, although the smaller model will carry sufficient fuel to operate for six hours. The turbine unit will be coupled with a 3600-r.p.m. generator through a reduction gear. If necessary, the mobile plant could be installed by only two men and operated by one.



Portable Suit Rack For Motor Trips

You don't have to pack your suits when you travel by car if you have an automobile clothes rack. Holding as many as four suits without wrinkling, the hardwood rack stands upright on the floor behind the front seat. When you reach your destination you pick up the rack just like a suitcase and take it with you into your hotel room. Placed in the closet or a corner of the room, the rack never has to be unpacked and is always ready to travel. If desired, the rack can be tied to the car robe rail with an attached cord.



Automatic "Prodder" Keeps Driver Awake

Falling asleep at the wheel is just about impossible when an automatic "prodder" is worn by the driver. The prodder consists of an alertness indicator developed at Tufts College of Psychology. The driver wears a headband containing electrodes that measure alertness. When drowsiness sets in and sleep threatens, the electrodes signal to the indicator which sets off a warning buzzer that instantly arouses the driver.



China's Ricksha Goes Mechanical

Faster but noisier than the man-drawn variety, a gasoline-powered ricksha has been introduced in Shanghai. Developed by three Chinese engineers, the vehicle, called a Rik-Mobile, has a single-cylinder, two-horsepower engine and goes up to 35 miles an hour. Total weight of the machine is 300 pounds.





Six stories high, these recovery columns remove the excess styrene from the latex as it drips down to the base. Steam, blown up through the columns, carries the styrene through pipes at top. Separated from steam, it is reused. Below, recipe for "cold rubber" in picture form. The ingredients at left form latex in about 12 hours. Dried and coagulated, the latex becomes rubber. Speed-up chemicals are in center

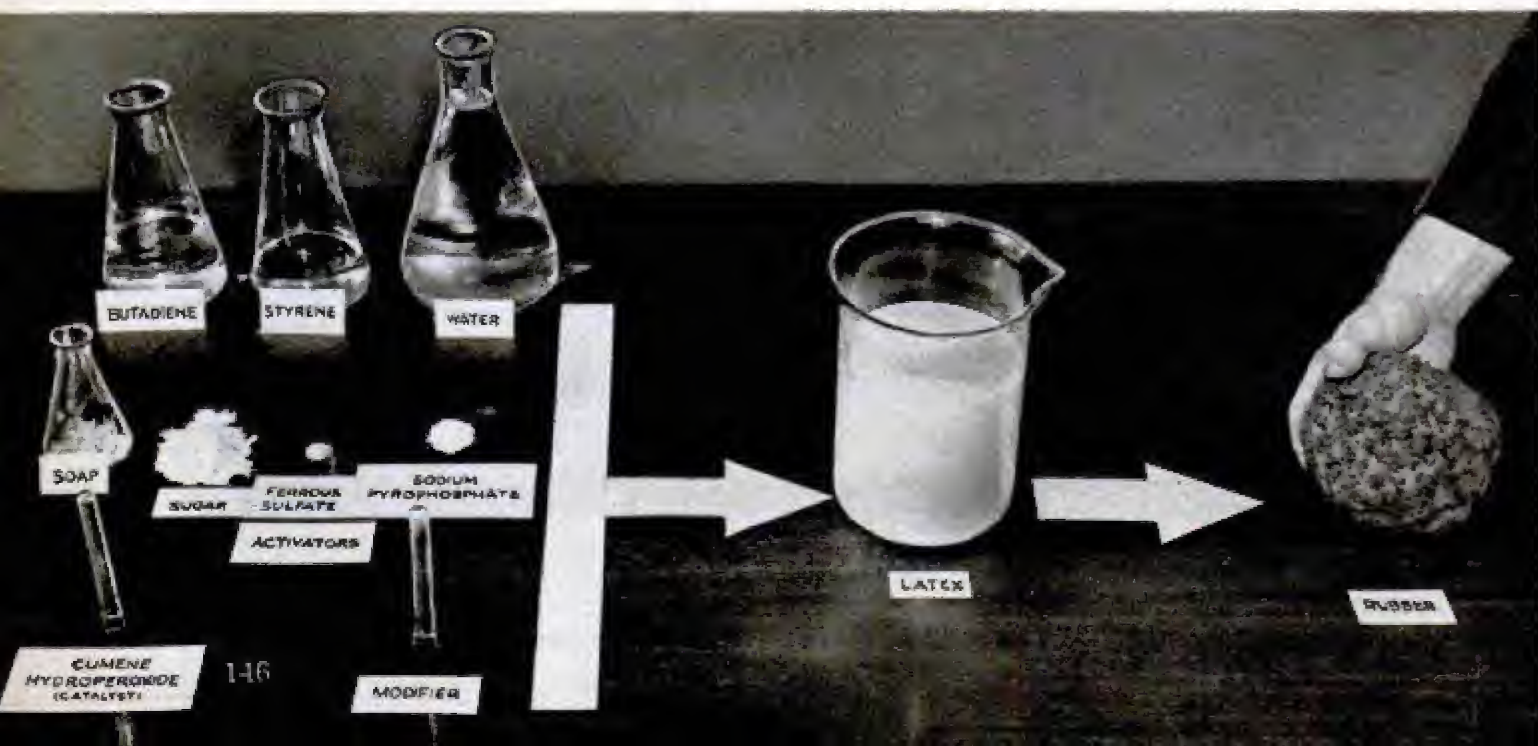
"COLD RUBBER" FOR YOUR TIRES

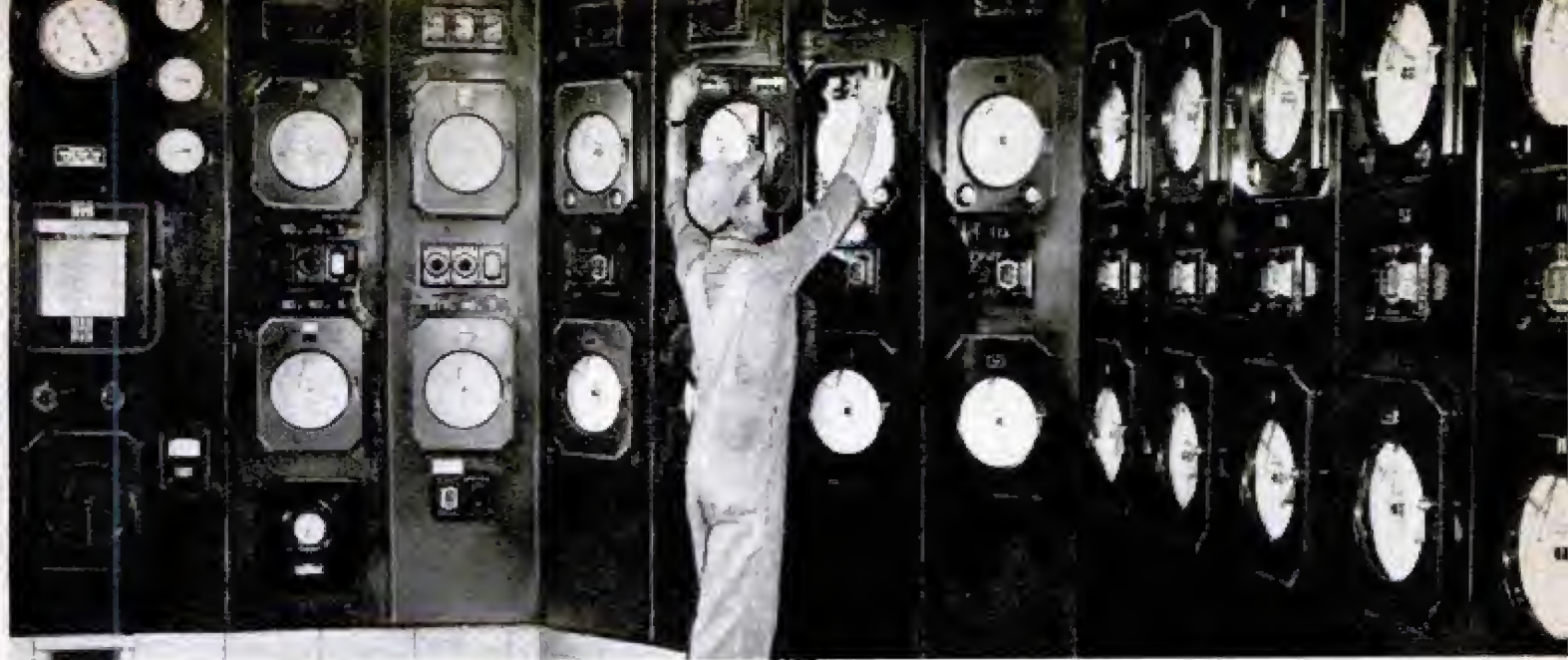
SYNTHETIC tires better than the natural-rubber variety are promised for your car because of a "cold war" science has been waging.

You'll get up to 30 percent more wear out of that set of synthetics when "cold rubber" is used. Produced at 41 degrees Fahrenheit, instead of the working temperature of 122 degrees previously used, the synthetic rubber also has improved tensile strength and crack resistance.

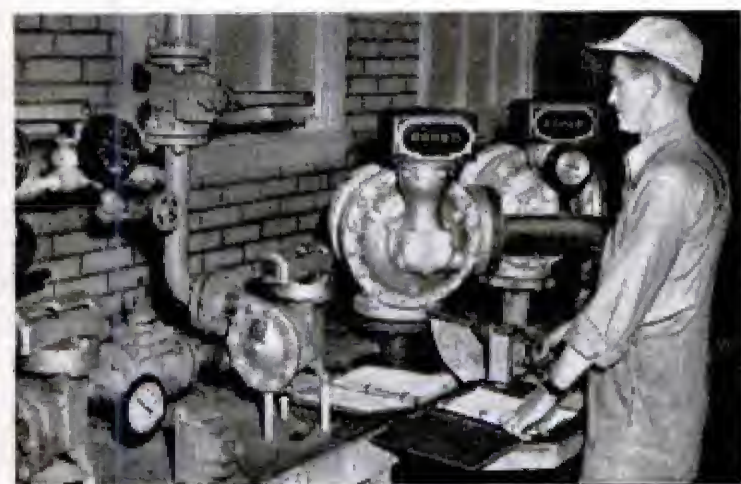
Up to now, the low-temperature process has been impractical because of the longer time required. Instead of the usual 12 hours, it took that many days to produce a batch.

By discovering chemicals that speed the combining of butadiene and styrene, scientists solved the problem. Rubber is now made at low temperatures about as fast as at high temperatures. Still not satisfied, however, the engineers are planning new methods of production at temperatures as low as zero degrees—and that will mean even longer-lived treads for you motorists.





Cooking a batch of synthetic rubber is more complex than baking a cake! Worker sets one of the instruments that record the cooking action for each batch



Above, ingredients for each batch are metered out precisely. Right, sugar is an important ingredient in the speed-up process. Worker pours sackful into dissolving tank. One pound of sugar is used to each 20 pounds of rubber. Below, part of the synthetic rubber plant operated by U. S. Rubber Co. in Borger, Tex. The recovery columns can be seen at the right





Lightweight Air Compressor

Light enough to be carried around like a tool kit, a compact air compressor provides plenty of pressure for inflating tractor and truck tires, high-pressure greasing, paint spraying and other tasks requiring compressed air. It has a 110-volt a.c. motor directly connected to the single-cylinder compressor. Maximum working pressure is 90 pounds and it delivers 1.2 cubic feet a minute at 80 pounds pressure. The hollow base of the unit serves as a tank, eliminating air pulsation, and also acts as an oil and moisture separator. A model using an air-cooled gasoline engine is also available.

Invisible "Raincoat" for Bricks

Brick and other porous masonry are protected from moisture by a semiplastic coating that becomes invisible after it dries. The coating is applied as a watery solution by brush or spray and is waxless and non-inflammable. When applied, it is opaque and milky white, but after application it becomes transparent.

Sudden Death Comes to a Bomb as Wartime Range Is Converted to Peace



Spotted by workers on irrigation dam, live two-ton bomb is a deadly souvenir of wartime bombing range

Dynamite and explosives in bomb detonate sending a dust cloud skyward. Blast is 3000 feet from camera



Bomb was turned over and sticks of dynamite piled around nose. Explosives were then covered with sand

Split wide open, shell of quarter-inch steel plate was hurled 500 feet by the force of the explosion



PLAY BALL!



Next time you're looking for somebody to play right field on your ball team it might pay you to visit the zoo and sign up a marabou stork! At least Lynwood M. Chace of New Bedford, Mass., who has a pet marabou, thinks so. The feathered fielder, who came here from Africa, became adept at picking up articles with his bill. Hammers and other tools disappeared too often, so Chace decided he'd better teach the bird a less bothersome trick. He bought a rubber ball and, after a few practice tosses from a short distance (above), the bird learned the art of good fielding. Using his high-speed flash unit, Chace photographed the bird in action to convince doubting Thomases. Left, the stork gets set for a line drive. Whoops! He misjudged the ball (lower left) and it bounces off his "glove." The next toss he fields perfectly (right) to retire the side. Looks proud, doesn't he?





Self-Defrosting Windshield Glass

Windshields are de-iced quickly and completely when the glass is heated like an electric hot plate by coating it with an invisible film that conducts electricity. Although normally an insulator, glass is a conductor when coated with a film that is basically stannic oxide. The film is placed on an inner surface of the "sandwich type" safety windshield. Current is fed to this surface through electrodes at the top of the glass. Because higher voltage than is available in a six-volt car system is required, an alternating-current generator is used and the current transformed to the voltage needed. In one test at six below zero, a windshield heavily coated with ice was completely de-iced in less than five minutes.

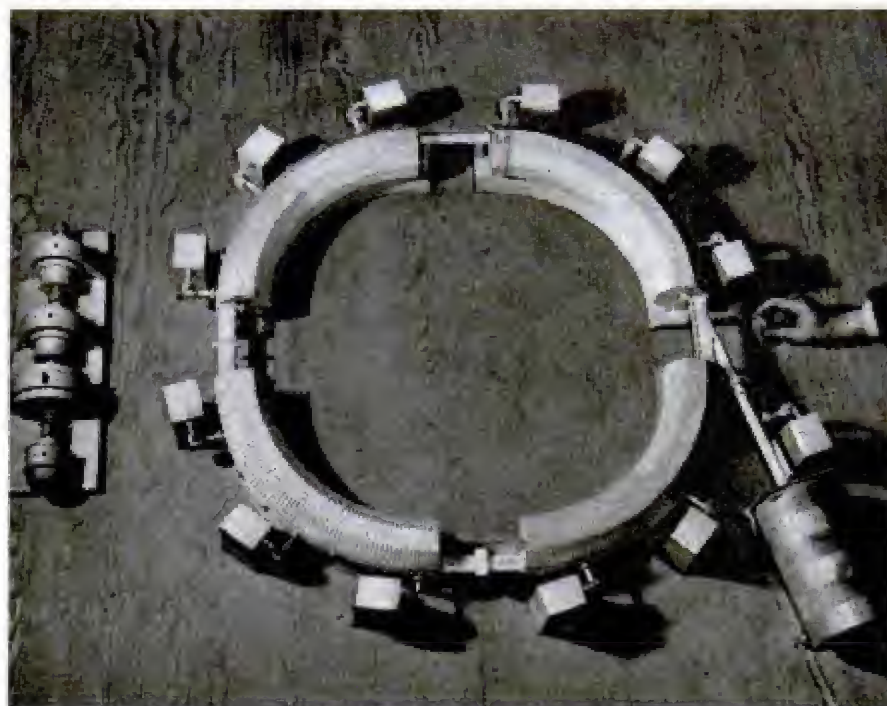


HANDY REFLECTORS can be nailed to trees, posts and other danger spots along private drives to warn motorists. One small nail driven through the plastic backing is all that is required to attach a reflector securely. Backing is waterproof and flexible to permit easy insertion of the sparkler. Other types are pin-on reflectors for pedestrians and bicyclists and a thumbtack model that shines brightly despite its size

Protons Will Hit 180,000 Miles a Second in Synchrotron

Duplicating the action of cosmic rays, a multi-billion-volt proton synchrotron to be built at Brookhaven National Labora-

tory will produce mesons artificially by bombarding hydrogen atoms with high-energy protons. The 60-foot synchrotron will accelerate protons to energies of three billion electron-volts. In a vacuum, these protons will speed around a doughnut-shaped tube surrounded by powerful magnets. Protons will reach speeds of nearly 180,000 miles a second or 96 percent of the speed of light. Launched at four million volts from a Van de Graaff generator, they enter the tube at an angle. By duplicating the cosmic-ray action, scientists hope to learn much about the properties of nuclear binding forces.



Circular track for the speeding protons is shown by this scale model of the synchrotron

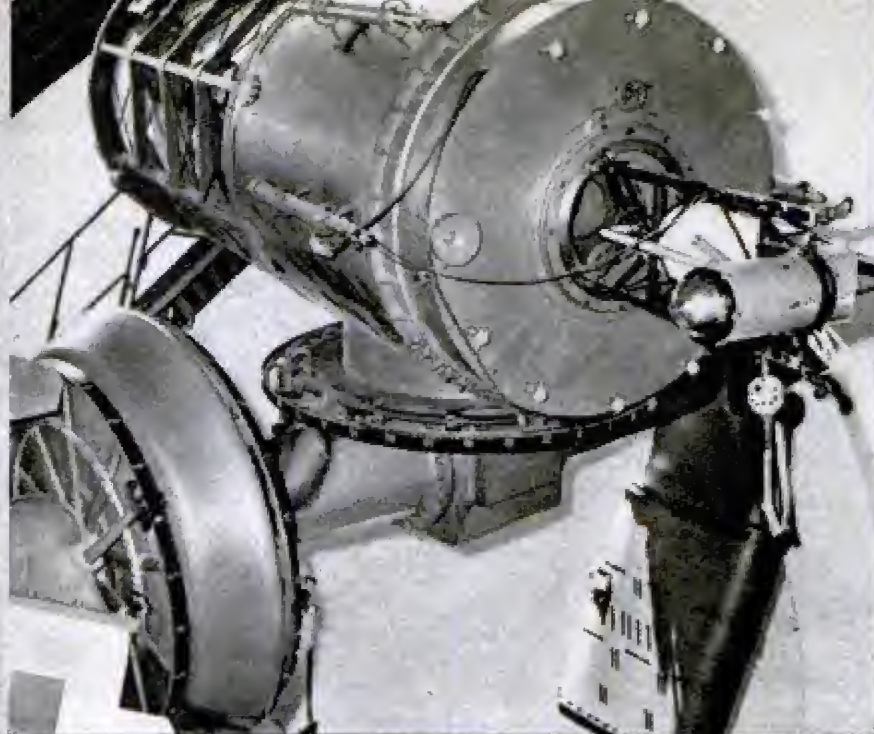
ASTRONOMERS doubt that Mars has a population resembling the human race but many of them agree that civilized beings may have lived on our sister planet in the past.

Mars, they say, appears to have reached a maturity that the earth will not attain for eons to come. Being smaller than the earth, it lost its heat and atmosphere more rapidly and is now a dying world.

During its more youthful period our next-door neighbor of the solar system quite possibly was prolific in both animal and vegetable life. Vegetation exists on large portions of the planet today, as indicated by recent spectrographic observations.

In the next 10 years it may be that good evidence of a civilized population, past or present, also will be found. The old controversy about the Martian "canals" may be settled once and for all by means of infrared spectrographs and other investigative tools. If the so-called canals exist, it will be almost necessary to conclude that they were laid out by an intelligent race.

The distance of Mars from the sun is about $1\frac{1}{2}$ times that of our orbit. Like the earth, Mars rotates on an axis. Its day is 37 minutes



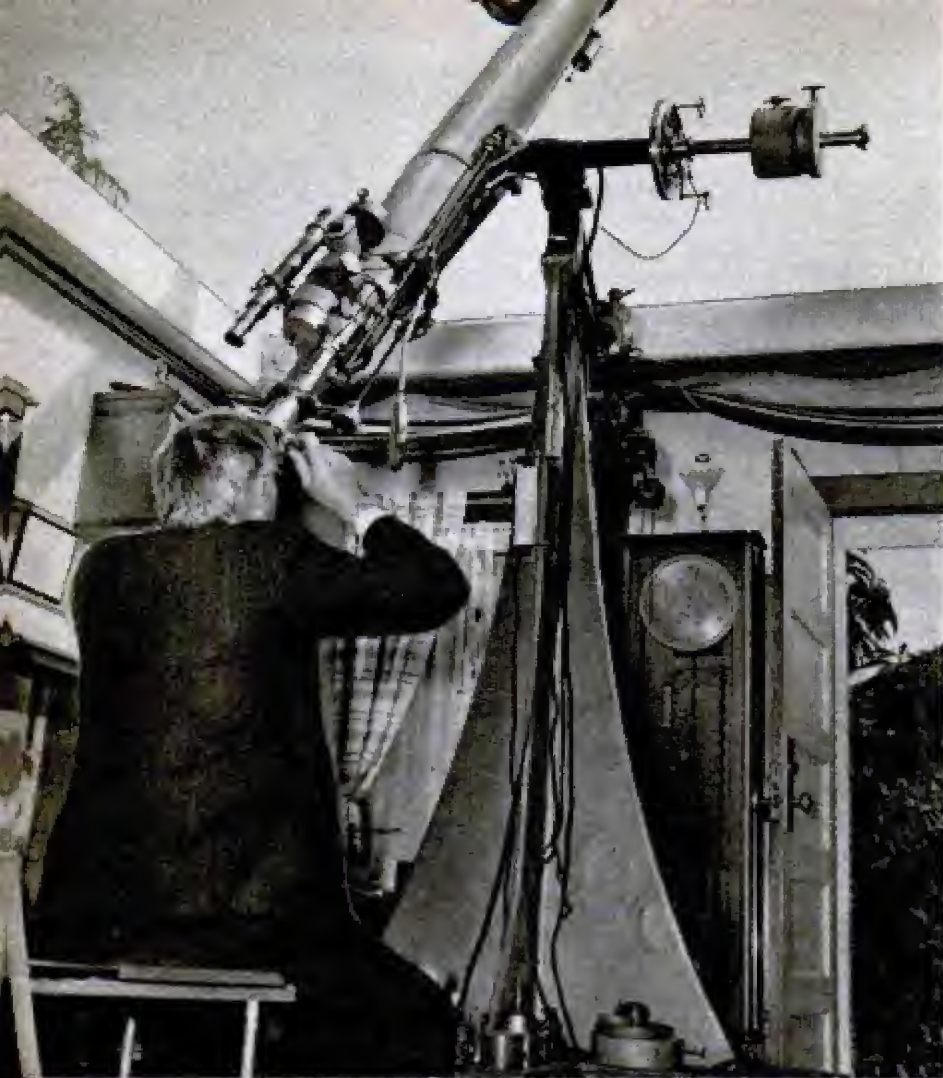
Infrared radiations from Mars gathered by this 82-inch telescope at McDonald Observatory revealed presence of vegetation on the planet

SPYING ON MARS

by invisible light

Amateur astronomer tests home-built spectrograph with carbon-arc setup at his shoulder. It is used in photographing spectrum of planets



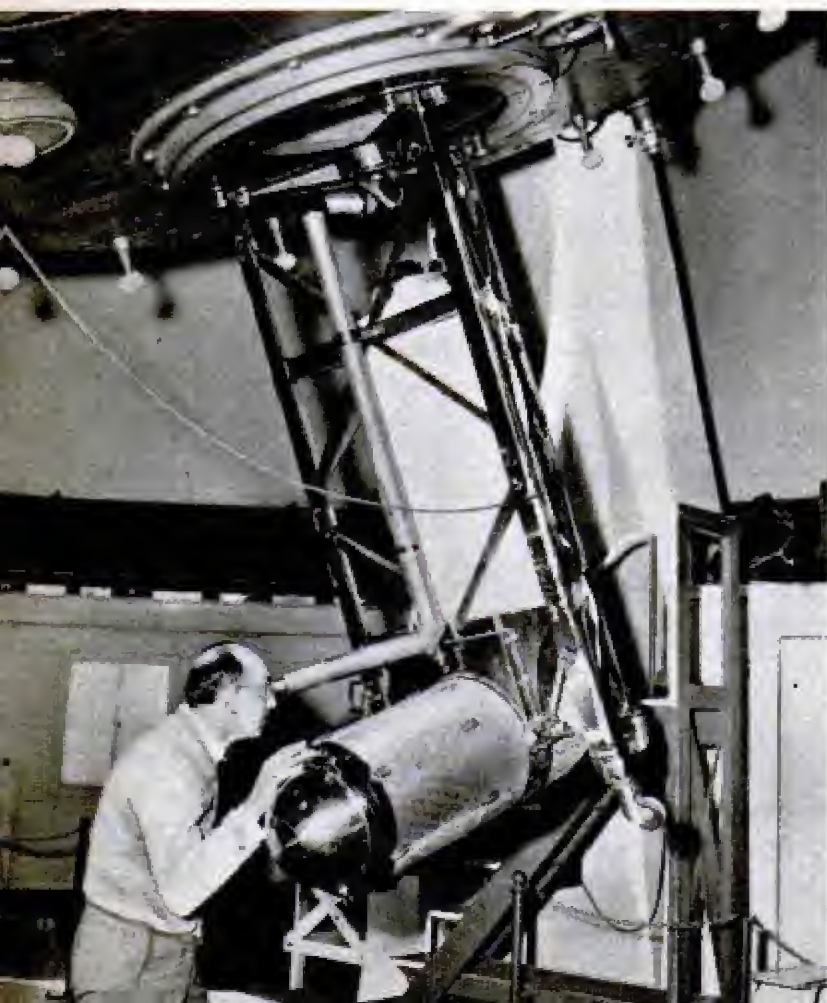


In his den, Dr. Edison Pettit of Mount Wilson Observatory uses 6-inch refractor telescope with which he saw canals on Mars. Below, sighting scope aims 82-inch telescope. The spectrograph is beneath it. Right, slide rule used by astronomers

longer than ours and its year has 687 days. Temperatures on the surface range from a high of 86 degrees Fahrenheit at noon to considerably below zero at night. Its thin atmosphere is possibly 60 miles deep and contains very little water vapor or oxygen, but considerable carbon dioxide. Like the earth, Mars has summer and winter seasons.

When an astronomer peers at Mars, he sees, suspended in space, a small hazy disk marked by large orange or reddish areas and by dark greenish "seas." Also visible, usually, is one of the white polar caps. Occasionally, thin clouds are observed, apparently high-altitude mists composed of ice crystals. Sometimes, too, yellowish clouds that persist for days are seen. These probably are terrific dust storms in the lower atmosphere.

The seasonal markings on Mars are regular and predictable. Autumn in the northern hemisphere is marked by the appearance of the polar cap that grows until it may extend half way to the equator, then recedes with spring and disappears with summer. For a short time during the summer season the greenish seas take on a brownish hue, then become green or gray-green again with fall. Mean-



while an opposite cycle occurs in the southern hemisphere.

Based on what they can observe and deduce from 50 million miles away, astronomers think that at one time Mars had plenty of oxygen and water vapor. These atmospheric constituents gradually trickled off into space. Some of the oxygen, too, probably combined with iron in the rocks to form the rusty colors that are visible now.

The red portions of Mars apparently are arid deserts, plateaulike continents on which only traces of earlier mountain ranges remain. One third of the planet is composed of darkish regions that possibly are old ocean beds, now filled with sediment to within a thousand feet or so of the level of the plateaus. The color of the seas is ascribed to vegetation, usually green, that temporarily turns brown in the most arid season.

Some of these premises were confirmed early this year when Prof. Gerard P. Kuiper turned the 82-inch telescope of the McDonald Observatory in western Texas on the planet. Most studies of Mars have been made by means of its visible light; Doctor Kuiper studied instead the invisible infrared rays that are reflected from it.

Energy that passed through the infrared spectrograph attached to the McDonald telescope was focused on a tiny lead-sulphide vacuum tube. The tube acts as a trigger for electrical energy when it is actuated by infrared energy. Instead of photographs Doctor Kuiper obtained jagged lines on pieces of graph paper. From these lines much information was obtained.

In the first place, the polar cap of the planet showed the typical reflection spectrum of cold snow. This confirmed previous thermocouple measurements by which the temperature of the caps had been taken. An earlier suggestion that the caps consisted of frozen carbon dioxide was disproved.

Since the polar caps consist of snow or frost, it follows that some water vapor is present in the Martian atmosphere. From this it can be deduced that the whitish clouds of the planet consist of some form of water, probably tiny ice crystals.

Ice crystals in the atmosphere, in fact, seem to account for the ever-present haze that surrounds



Above, this amateur astronomer tests his 10-inch reflector telescope. Below, view inside a 10-inch reflector telescope shows reflection of mirror in base of tube. Black object in tube holds prism that directs light to eyepiece on the side





Above, drawings made by Doctor Pettit during period of "super seeing" show how disputed canals appeared to him. Canals are said to be evidence that intelligent life once existed on Mars. The dark areas are thought to have been seas and the long canals may have carried water across the arid continents as Martians struggled to survive in the drying-up period. Below, model of the planet Mars on which the canals have been plotted as reported by astronomers

the planet. The conclusion is that the Martian sky would appear white instead of deep blue, somewhat like a hazy day on earth although with extremely good visibility.

When Kuiper made spectrographic examination of the greenish portions of the planet, the reflection spectrum that he obtained was found to be similar to the spectra of lichens and mosses such as grow in the high altitudes of the Rockies and the Himalayas. Absent, however, were any signs of the two highest divisions of plant life—seed plants and ferns.

The lichens and mosses of Mars probably are not identical with those of the earth. Some of the Martian vegetation appears green, some of it looks blue, and all of it changes to brown or red in the dry season. The assumption is that the vegetation must be very dense and may attain giant size.

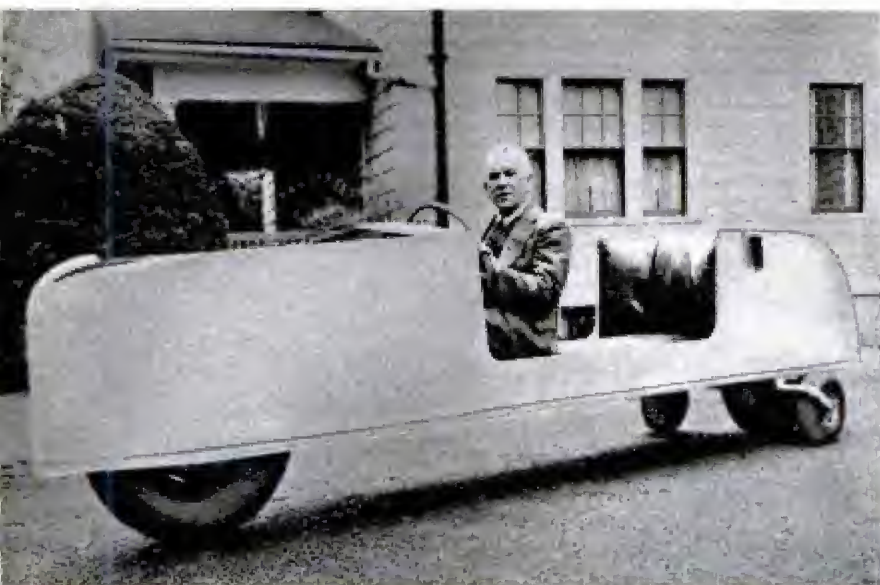
Astronomers have been looking for a substance in the Martian atmosphere that absorbs the lethal ultraviolet radiations from the sun. Ozone acts as a shield for us on earth, but tests for ozone on Mars have been negative. Sulphur dioxide also could serve as a

(Continued to page 248)



Lawn-Sprinkler System Controlled by Clock

There's no reason for your lawn to become parched while you're away or because you can't find time to water it. An automatic control for lawn sprinkling is operated by a seven-day clock. You just set the dial and the lawn gets its water automatically at the times you specified. The lawn is divided into sections, each having a separate system of underground pipe. The systems operate one at a time in short rotation giving the lawn a series of brief showers. The period of flow can be varied to provide more water on a sunny area than a shaded one.



You Name It!

Automobile or motorcycle? Albert A. LaPointe of West Hartford, Conn., can't decide how to register the vehicle he invented. It has a standard auto wheel in front and a similar wheel in the rear which is flanked by two smaller wheels. When the vehicle reaches a speed of six miles an hour, the side wheels lift two inches off the ground and the car is balanced like a motorcycle. The 25-horsepower engine is installed and housed directly behind the rear seat.

Swiveling Tail Propeller

Forward push as well as directional control is provided for helicopters by a swiveling tail propeller designed by Daniel R. Zuck of Los Angeles. In contrast to conventional fixed installations, the axis of the propeller mount can be varied in flight by the pilot. During landing and take-off it is swung around sidewise to counteract the torque of the larger main lifting rotors.

☐ Now extinct, the passenger pigeon was the most numerous of all North American birds a century ago and a flock observed in Kentucky was estimated at more than two billion.



"Crew" of Model Sailboat Takes Orders From Skipper by Radio



Left, receiver is amidships and motor for sheets is forward. Right, radio-controlled, the boat sets sail

With its "crew" of two motors and a radio receiver, an electronically controlled model sailboat responds to the skipper's commands with a precision that even the best sailors couldn't excel. By means of a shore transmitter, Yates Hickey, Jr., of Seattle can take in or let out the main and jib

sheets and control the rudder even though the boat is several miles from shore. Two small, reversible motors, one in the bow, the other in the stern, control the sheets and rudder. The receiver and batteries are mounted amidships. A portable antenna is used with the shore transmitter.



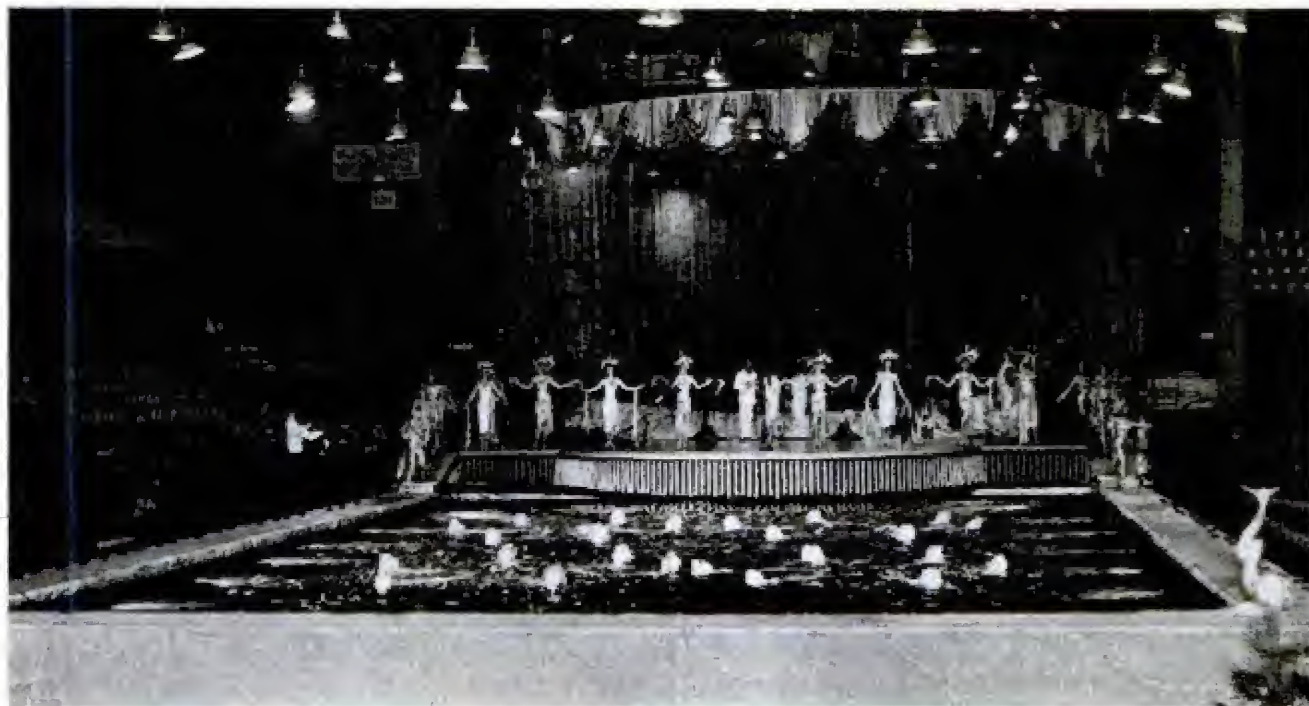
Turbine-Driven Auto

Wood or coal is burned as fuel in a turbine-driven auto built by J. E. Mitchener of Los Angeles, Calif. He constructed the car on a Model-T Ford chassis cut down to a 58-inch wheelbase and a 29-inch tread. The boiler holds five gallons of water and is of the return-fire tubular type with a superheater. The turbine is installed in front of the boiler and connected with the drive shaft by a belt. Mitchener made all the boiler and turbine parts himself.

One-Man Boat Loader

One man can load a boat atop his car with a boat loader and carrier based on a counterbalancing system. The loading frame is attached to the gunwales while the boat is on the ground and then the boat is swung up into carrying position easily. The carrier will fit any car and is attached to the rear bumper with two wing nuts. Positive locking prevents shifting of the carrier. It is lightweight and does not interfere with vision or use of the car trunk.





Portable Swimming Pool

Sixty times a year stagehands with the water show "Aqua Parade of 1948" move a full-size swimming pool from city to city. The "pool" is a nylon water-retaining liner coated with synthetic rubber. It measures 54 by 84 feet and forms a pool 72 feet long, 42 feet wide and four feet deep. The tank holds 98,000 gallons of water and can be erected within three hours. A diving pool that travels with the show is 25 feet in diameter and eight feet deep. The two liners, built by Goodyear, are installed over metal retaining walls to form the pools. The larger pool weighs only 1400 pounds when packaged for shipment, yet it holds about 784,000 pounds of water.

Pool can be erected in less than three hours. Below, diver prepares for plunge into tank made of nylon coated with rubber



Ball-Point Pen Worn on Tie Clip

You'll always have a pen handy when you wear a tie clip that holds a detachable ball-point pen. The midget pen has a retractable point to prevent soiling the tie or shirt front. It snaps securely into a friction holder mounted on the front of the tie clip, which does not have to be removed when the pen is being used.

Elastic Shoelaces

Shoes with elastic laces can be slipped on and off like bedroom slippers. After the laces are adjusted and tied they require no further attention. The laces are of suitable length for all low-cut shoes.



REMOVABLE KEY must be inserted in this gas range before burners can be turned on, preventing small children from turning on the gas. Key can be stored conveniently but out of reach of young hands

SLEEPY-TIME BULB is plugged directly into a wall outlet to light stairs and corridors after dark. The low-wattage lamp costs only 2½ cents a month to operate around the clock, has average life of one year



WHAT'S NEW *For Your Home*

Sources of supply for these products may be obtained from Bureau of Information, Popular Mechanics Magazine

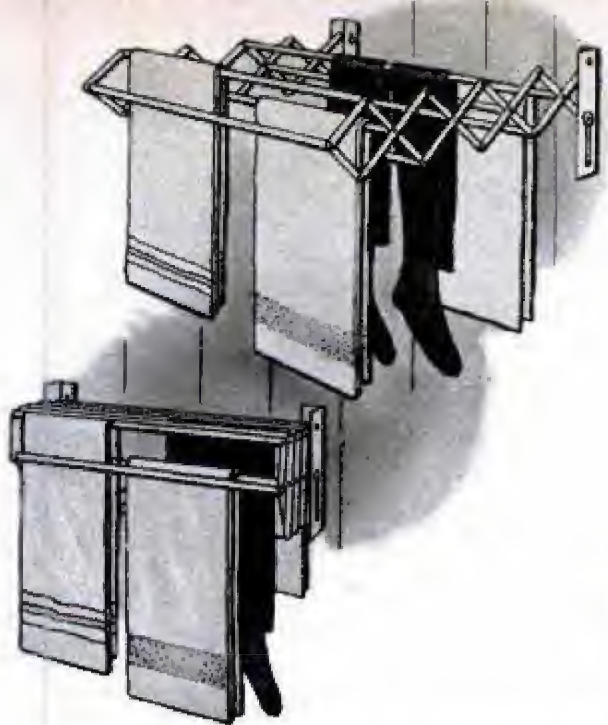
CLOTHESLINE CLEANER for pulley-type lines clamps around the bottom strand. As the line is reeled out both strands pass through a knitted cloth which may be used wet or dry. Cloth is removable for washing



STEAM-JACKET COOKER cooks food with steam but not under pressure, permitting the housewife to lift the lid. Steam surrounds hollow walls of the inset

SHOPPING REMINDER → has flags that flip over to indicate the needed foods. Ready for shopping, the housewife checks flagged items with pencil, then tears list off the pad





DRYING RACK provides 15 feet of hanging surface in only 1½ feet of space. When open, the rack extends 18 inches from the wall; closed, it projects only 2½ inches. Hardwood rods won't snag fine fabrics

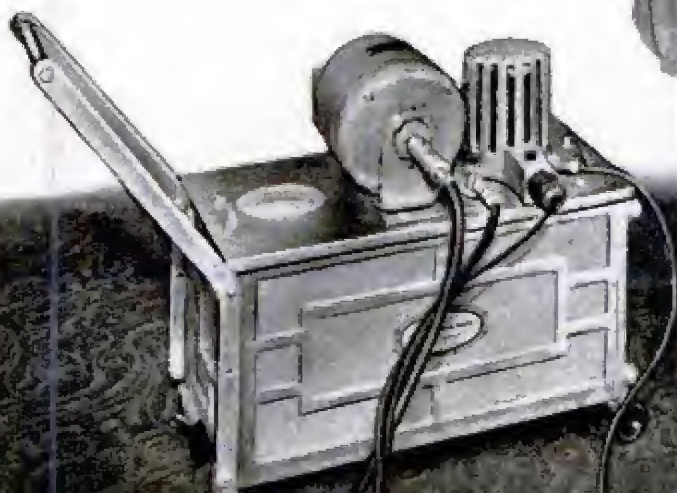


FAN ON WHEELS can be moved to any part of the house and pulled up or down stairs. It is capable of changing the air in the living quarters of an ordinary four or five-room house every two minutes



↑ **SPACE SAVER** for refrigerators hangs from regular shelf but it occupies space normally wasted. Made of chromium, it not only holds bottles, cartons of eggs and fruit, but places them within easy reach

↓ **UPHOLSTERY CLEANER** brushes dirt from furniture and rugs with dry suds. One motor rotates the brush and another pumps cleaning solution into the head. Dry suds clean fabric without penetrating upholstery





British Version of Jeep

Similar in appearance to the American jeep, a powerful British vehicle has a road speed of 50 miles an hour and makes 25 to 30 miles on a gallon of gas. The little truck can be fitted with a rear or center take-off shaft for powering farm implements. It has a four-cylinder engine with four forward speeds and a reverse. A transfer box incorporates two speeds, providing a total of eight forward speeds. A power-driven winch can be mounted on the bumper for moving heavy machinery. Engine parts are protected so the vehicle can be used to ford streams.

Small truck, with engine parts protected, plunges through a stream. Below, jeep influence can be seen in British model



Door Jig Helps Fit Hinges

Doors can be hung to fit the jamb perfectly with a jig that can be used either in the shop or on the job. The jig permits the carpenter to cut the hinge recesses in the door and the jamb simultaneously, eliminating the tedious job of fitting a door to a frame that already has been installed. The recesses for the lock plate and the keeper plate are positioned and cut in the same manner as those for the hinges. The jig handles doors of any size and frames of any thickness.

⌚ Lawns should not be cut less than 1½ inches high because shorter stalks do not provide needed shade for the roots.



Multi-Purpose Charcoal Grill

When not being used for cooking, a stainless-steel charcoal grill can be left in the yard to be used as an outdoor serving table or birdbath. When the grate and firebox are removed, an aluminum tray (top left) fits over the unit. Set up for cooking, at right, it is large enough to grill steaks for a group. Center, another model comes apart easily without tools and stacks neatly into the base for carrying and storing.



Child's Height-Measuring Standard Doubles as Clothes Rack

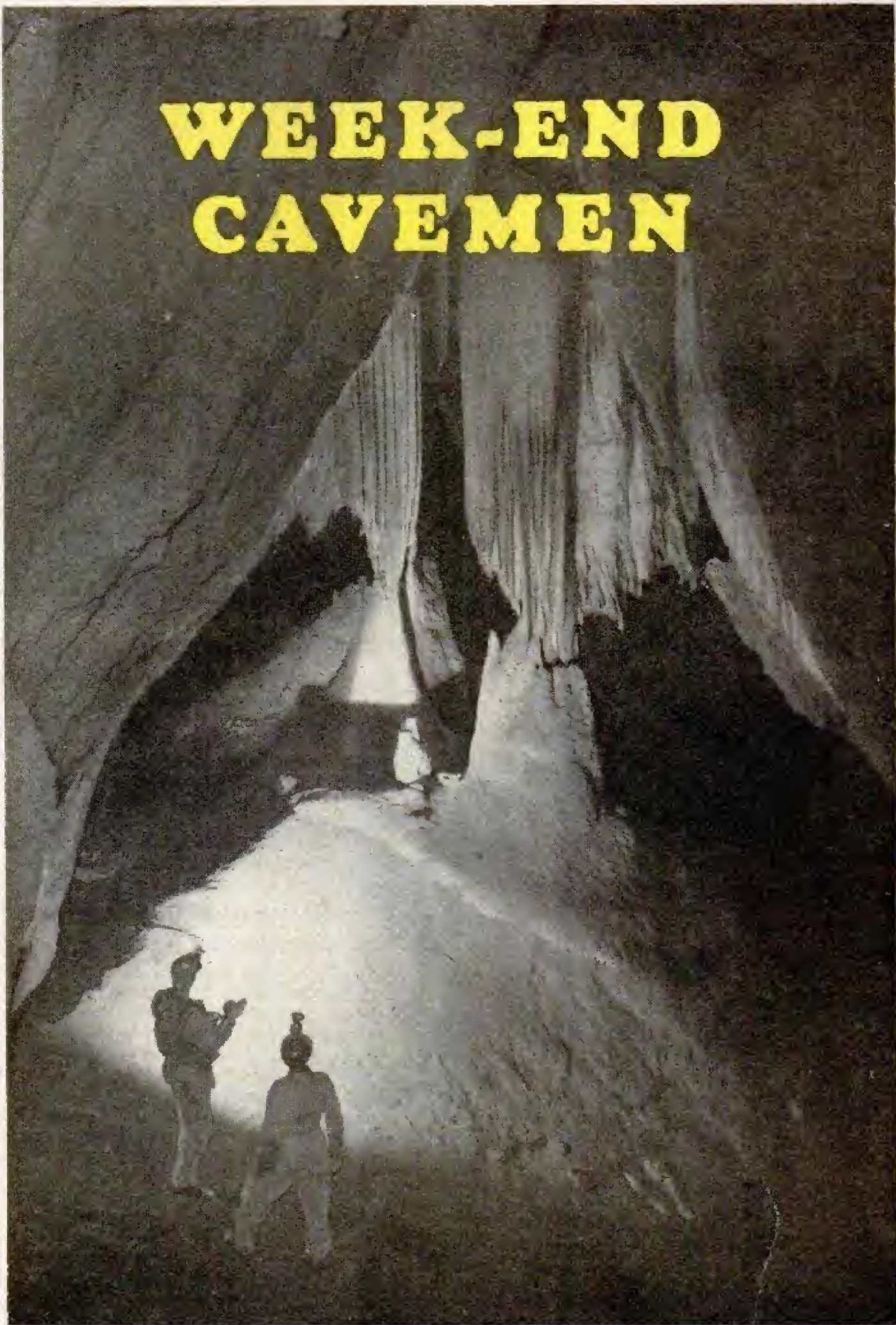


In addition to its main purpose, a new height-measuring standard for children has removable pegs that make it into a clothes rack. It is calibrated in one eighth inches up to four feet and has an average height and weight chart printed on the base. The top scale section can be detached to measure infants too young to stand.

Recovery of Diamond Dust Speeded by New Process

As fine and white as face powder, diamond dust used for polishing tungsten-carbide dies is being recovered after use by a new and rapid process at the General Electric Laboratory. Previously, the precious powder was recovered only after long treatments in acid that dissolved everything but the diamond dust. The new process combines burning, washing in hydrochloric acid, baking at 800 degrees Centigrade and a final wash in caustic soda. It reduces the time required from weeks to hours and the chemicals needed are negligible. In 1947 the laboratory recovered 1033 carats of diamond dust.

WEEK-END CAVEMEN





Spelunker is lowered by line through the entrance of a newly-discovered cave for a look at the underworld

By Henry F. Unger

THEY DON'T CARRY menacing clubs and drag their mates by the hair, but they are genuine cavemen. They vanish into uncharted caverns and crawl across subterranean floors in a hobby that provides thrills unknown to surface dwellers.

Factory workers, clerks, doctors — all kinds of people from more than 30 states have banded together into an organization of spare-time cave explorers called the National Speleological Society. Real cave hunters, named speleologists, are the backbone of the society and lend it the dignity of a genuine scientific approach. The hobbyists, eager only to see the underground and to explore uncharted caverns, are called spelunkers. About 30 percent of the society's members are women.

Back in 1939 William Stephenson of Maryland founded the society to organize cave exploration. Today "Grottoes" of cave-hunting hobbyists make regular sorties into caverns of the limestone belt.

With most of the surface of the earth explored, members are convinced that there remains an untouched field for pioneers in the underground. Relatively few caves have been explored and still fewer mapped. But cave exploration is no Sunday picnic.

Veterans tell newcomers what equipment to use and what to expect in caves. Above all, new groups are told what to do in the event of separation. A group of more than eight persons is considered too large. A flexible time limit is placed on a band; if

the newcomers fail to pop out of the cave at the expiration of the time limit, another expedition squirms in to see what has happened to them.

Spelunkers are impressed with the phrase "a clear head will find itself." Loss of mental equilibrium is more dangerous than the loss of equipment. One enthusiastic

Nylon rope is tested before this caveman ventures into cavern. He carries electric light and candles





Members of mapping crew measure one of the cave's larger rooms with a tapeline. Below, one explorer helps another wriggle through a small opening into another section of a large cave



spelunker, lowered by line to the floor of a large cave, immediately vanished into a side passageway, eager to explore by himself. He soon emerged into a large room. For a few moments he wandered about and then entered the wrong passageway. Completely confused, the man became panic-stricken. He shouted without knowing that a voice travels only about 50 feet inside a cave. Despairing, he sat down to cry. His friends pushing ahead through the underground channels finally found him.

But rarely are the cave hobbyists lost and then only for a short time. Explorers are taught never to enter a cave without plenty of spare lighting material. Waterproof matches are essential. Some spelunkers use candles entirely. A flashlight or extra batteries for it might become soaked.

In some circles, amateur cave hunters believe a large ball of string should be payed out to insure a safe return to the entrance. Expert speleologists say this is the bunk. If the cave is a large one, they contend, it would be impossible for the average party to carry enough string. If the cave is small, the explorers are not likely to become lost. The best guide for the return trip is a pile of stones in an unmistakable pattern with the top one pointing in the proper direction.

The newcomer is likely to feel the weight of claustrophobia. Suddenly he will run into a blank wall and find that all the openings lead to other dead ends. Before he moves another step he is urged to stop, sit down and determine where he made his mistake, where he took the wrong turn. The spelunker should remember that he left footprints or some other trace of passage on the floors. He can look for broken matches, candle tallow, anything tossed aside. If necessary, the "lost" spelunker can free himself by the process of elimination—by venturing into one passageway after another to determine the correct one. Many large cave rooms have only small entryways and it is in locating small holes on the return trip that some beginners become confused.

High on the list of speleologist

"musts" is the mapping of a cave. High humidity and the stickiest kind of mud make cave mapping a real task. The speleologist cannot use an ordinary transit or plane table. Poor lighting, short lines of sight and large instruments eliminate this. In using a transit it is necessary to have a steady, pin-point source of light. To measure ceiling heights the mapping experts use a simple balloon filled with hydrogen and attached to a string knotted at five-foot intervals. Photos are taken for later study. A minimum of two persons is necessary for mapping. The lead man on the tape does all the recording, while the rear man makes all compass and tape readings.

When speleologists descend into uncharted caves they root out the information about main rooms and leave side passages for future work. Some caves will provide years of work for the hobbyists. A name often describes a phenomenon connected with the cave; "Breathing Cave," for instance, takes in and expels air in eight-minute cycles.

Hundreds of cave explorers have Prof. Edouard Alfred Martel to thank for methods they use to uncover cave secrets. He is the founder of the science. For 50 years he labored exploring more than 1000 caves, giving future speleologists a basis for their explorations.

Today, scientific information is entered in books which are sent to the society's headquarters in Washington. An extensive library revealing the "innards" of caves has been built up through these contributions. Minerals scooped up by the cave hunters are shipped to the National Museum in Washington.

With members ranging from a 69-year-old speleologist to a nine-year-old spelunker, the society asks only that prospective members be sincere and enthusiastic about the hobby. The society keeps members informed of discoveries and the activities of other members through a monthly newsletter. For some of the members, a glimpse of the delicate rock formations or fossil-packed cliffs is sufficient reward for regular descents into the underground. But for others, it is a chance to do research in archeology, paleontology, mineralogy, natural history, geology and other sciences.

Members of the society can proudly say that they assisted directly in the victory over Japan. When American troops were puzzled about how to dig Japanese soldiers out of caves, officials of the society were called in. They took government experts to every type of cave opening. For days the experts blasted the cave entrances until they mastered a technique that finally was adopted in the Pacific.



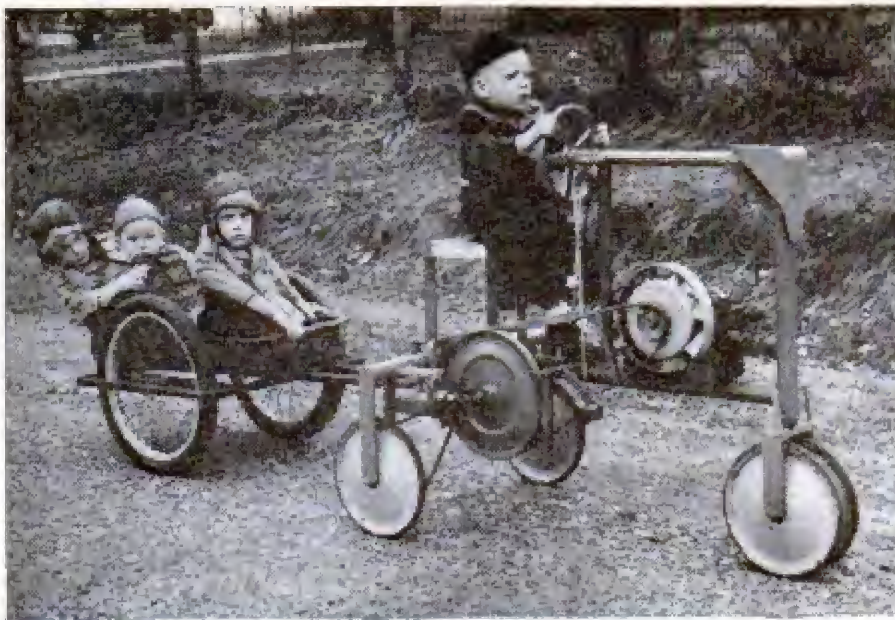
All-Metal Bilge Pump Fits in Tackle Box

Only 16 inches long, a bilge pump that fits in a tackle box pumps at a rate of two gallons a minute. With no leather parts to wear and go out of order, the pump is all metal and weighs only one pound. Small but powerful, it throws water 12 feet over the gunwales.

Sharpener Adjusts for Any Point

Pencils are sharpened to any point desired by a sharpener with an indicator cap. Adjusting the cap determines lead length and sharpness. The Bakelite case seals in graphite particles and wood shavings, eliminating soiled fingers. It is easily emptied and its hollow-ground blades are replaceable.



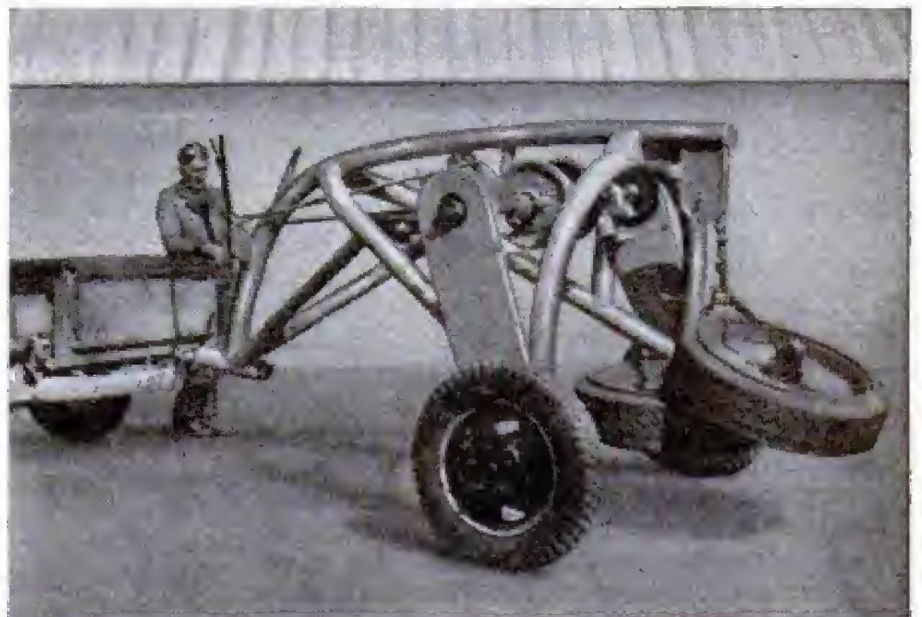


Pint-Size Tractor Has Gas Engine

Driving his own gasoline-engine tractor, three-year-old Gus Dobert of Nashville, Tenn., is the envy of youngsters of his neighborhood. Made by his father, a machinist, the small tractor has a two-cycle washing-machine engine. Power is transmitted by a V-belt and sprocket chain. The gear ratio insures lots of power but little speed. The clutch pedal tightens the belt on the pulleys.

Log Sulky

Logs are automatically lifted into position for dragging to the mill by a sulky which eliminates the conventional winch. In tests, the sulky has raised 1200 pounds of truck tires off the ground. Designed for use behind trucks, farm or crawler-type tractors, the sulky has a drum-wound cable which is payed out to hook onto a log. Conventional sulkies use a winch operated by hand or power take-off to drag the log to the towing vehicle and raise its front end off the ground. The operator of the new sulky merely drives off in his truck or tractor. When the sulky wheels



start turning, a chain rotates the drum to pull in the log and elevate the front end of it to a predetermined dragging height.



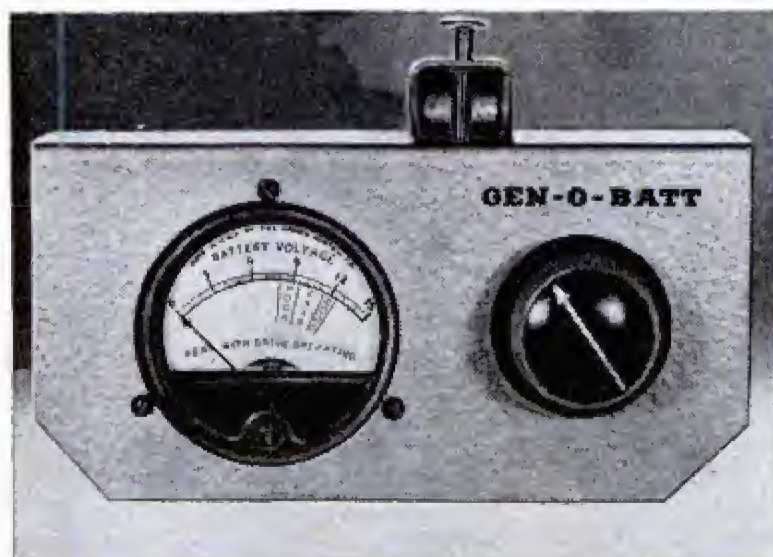
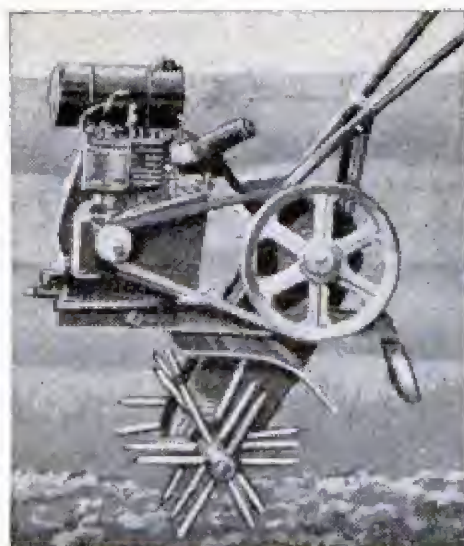
Rider Lies Down To Drive Motorcycle

Driving from an almost prone position, Alberti Raffaele of Switzerland is attempting to set a new speed record on a motorcycle of unorthodox design. The handle bars are mounted lower than usual and the footrest is above and behind the rear-wheel sprocket.

¶ As much as 50 barrels of water may evaporate from the leaves of a large elm tree on a hot summer day, the Department of Agriculture reports.

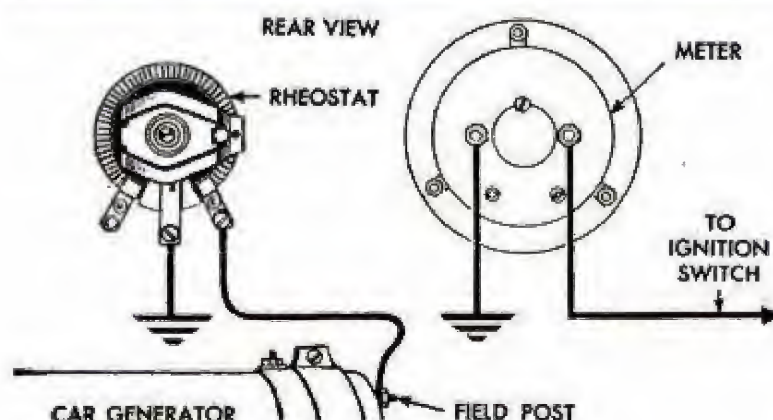
Wheelless Tiller Rolls on Its Tines

With no wheels or tracks, a lightweight power tiller is supported and driven forward by its spikelike soil agitators. Because of this unusual design, no power is wasted driving the machine forward and it cultivates right up to a fence or building. Power goes directly to the cultivating tines which rotate at two different speeds, pulverizing the soil thoroughly and quickly. Two rows of tines in the center rotate at a slow speed, while the four rows on each side of center rotate about five times faster. This difference in speed causes the cultivating action. It will till the soil to depths from $2\frac{1}{2}$ to 10 inches. The machine can be driven over lawns and driveways without digging when only the slow-moving prongs are used.



Generator Regulator

Designed for motorists who experience difficulty in keeping their car batteries fully charged because of short trips or city driving, a manually controlled generator regulator permits the charging rate to be stepped up at will. Conversely, on long trips the charging rate can be reduced to prevent overcharging the battery. The manual regulator works independently of the automatic regulator already on the car, which functions in its normal manner when the manual regulator is not in use. Mounted on the instrument panel, the regulator has a dial that shows the charged condition of the battery.



You may wish to obtain additional information about the new products described each month in Popular Mechanics. If you want to know the name and address of the manufacturer or distributor, just write to Bureau of Information, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Ill.



Camera Takes "Movies" on Standard Cut Film

"Movies" you can carry in your pocket and show without a projector are taken by a special camera that uses cut film and has no shutter. While posing for the picture, the subject can move and act just as he would for a movie camera. The camera is coupled to speed lights that fire 180 flashes a minute. Each flash produces an exposure. The film is transported automatically between flashes so that 42 separate negatives

are made on one sheet of 4 by 5 cut film. The film is then enlarged and the 42 photographs mounted as pages in a book about the size of a match folder. When the pages are riffled, action of the subject is reproduced. No other lights are needed because the speed lights have built-in modeling lamps that go off when the camera is operating. Operation is automatic once the starter button is pressed.

DDT Is Made Twice as Deadly by Adding Dash of Oil

Insecticides such as DDT and pyrethrum become more than twice as deadly to insects when coupled with a derivative of sesame oil. At the same time, the insecticide is less dangerous to household pets and

humans. Roaches, against which DDT is not very effective, are easy victims of the insecticide when the sesame-oil product is added. Many insecticide makers are now using this ingredient in their aerosol bombs.

see
INDEX
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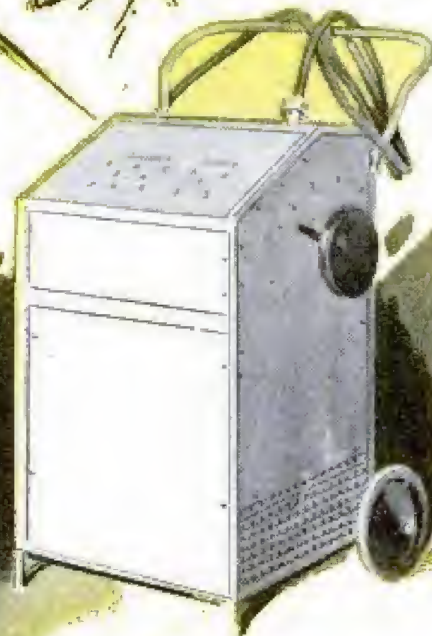
Ratchet-Type Bumper Jack Extends at Both Ends

From an 11-inch height a ratchet-type bumper jack extends at both ends to reach 28 inches. The jack is turned by hand until it is high enough to reach the bumper. Then a short handle is inserted and worked back and forth to boost the jack still higher. A ratchet permits the jack to be moved up or down with relatively little motion of the handle. The jack is mounted on a wide base, weighs six pounds and will lift 1500 pounds.

¶Fifteen types of British gas-turbine-propeller engines for airplanes are either in actual use or in various stages of development.



BUILDING
STAIRWAYS



ARC WELDER

The CRAFTSMAN

★ To give hobbyists authentic step-by-step instructions on pottery making, page 181, we enlisted the aid of a well-known authority on ceramic sculpture. The resulting article describes methods of casting in plaster molds, throwing techniques on the potter's wheel, the processes of coloring, glazing and firing and the construction of a kiln and potter's wheel.

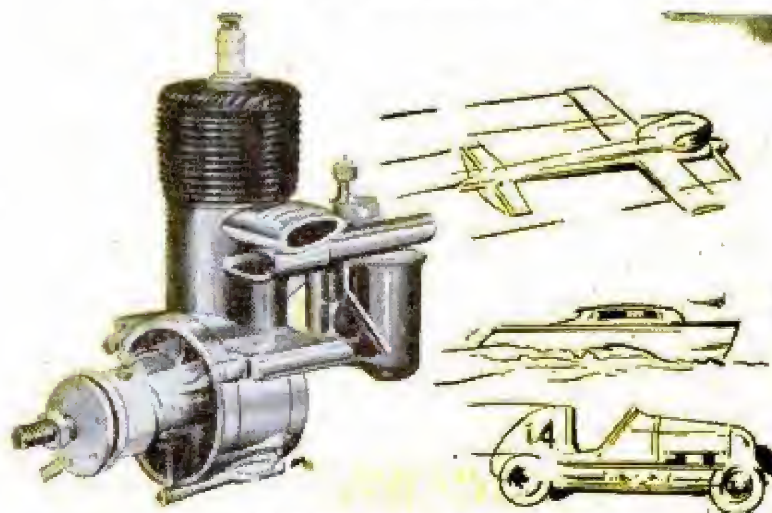
★ Farmers and shopmen will find it easy to follow the directions on page 205 for building an a.c. transformer-type arc welder that will handle 3/16-in. welding rod. Instructions are given for rewinding an old transformer to give the necessary amperage output.

★ Building stairways calls for plenty of woodworking know-how, especially when laying out and building from scratch without any standard pre-cut parts. To help craftsmen who like to tackle such jobs we've prepared a practical article, page 212, on wooden-stair construction.

★ An article on page 194 acquaints you with important points to keep in mind when purchasing a power plant for a model racing plane, boat or car.



CERAMICS



PICK THE RIGHT ENGINE

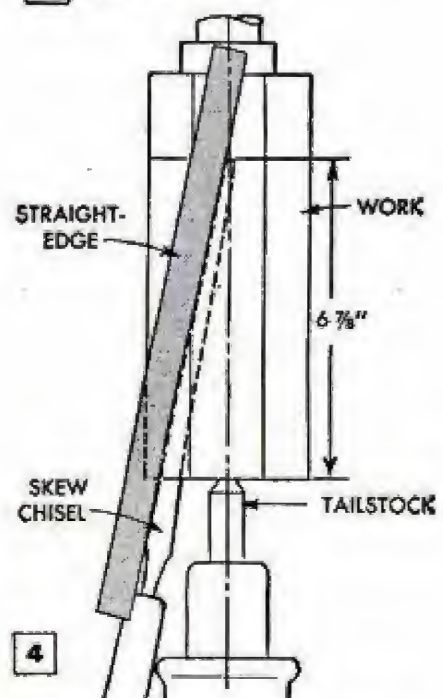
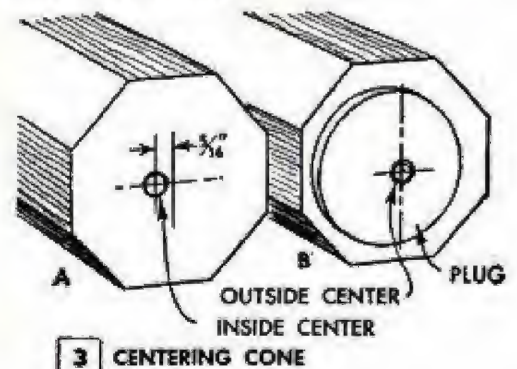
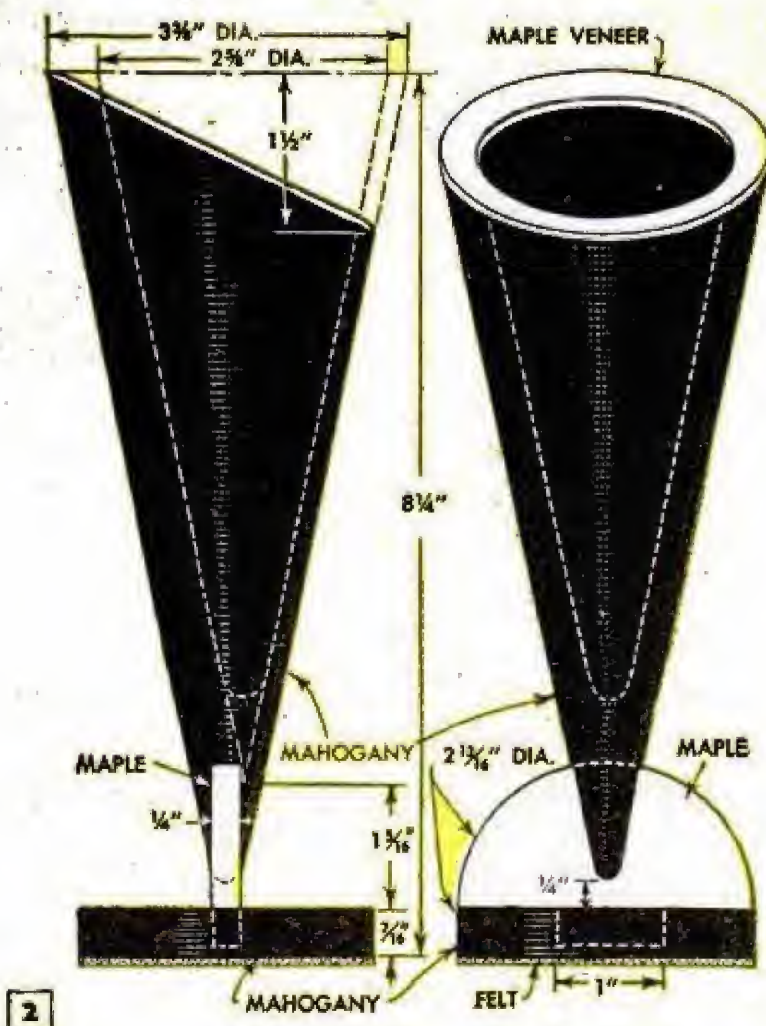
Distinctive FLOWER

By Milt Evans



When the turning is completed it is cut free of the waste in the manner shown above. The skew is held with the left hand and the work is caught as it falls

CONTRASTING mahogany and maple combine to make this little vase for artificial flowers a striking and unusual ornament. To make it, cut a $3\frac{5}{8}$ -in. mahogany turning square $8\frac{1}{2}$ in. long, and plane off the corners 45 deg. Mount the block in a lathe so that it is offset $\frac{5}{16}$ in. at the tailstock center, as in Fig. 3, detail A, and extend the quill of the tailstock to the limit to give working clearance. Bore inward from the end, using a narrow skew chisel to hollow the inside to correspond with the shape indicated by the dotted lines in the profile view, Fig. 2. To guide the direction of the chisel, mark a line around the turning block $6\frac{7}{8}$ in. from the tailstock end. Then lay a straightedge on the top of the block in the position shown in Fig. 4, and align the chisel with the straightedge by sighting along the edge of the chisel. When the chisel enters far enough to reduce the core to the point of breaking off, remove the turning from the lathe and break out the waste core by hand.



VASE



5 PLUG RE-ESTABLISHES CENTER



6 METHOD OF MARKING TOP

To provide a center for turning the outside of the vase, plug the open end with a tapered plug, Fig. 5. This plug is glued in place with paper between the parts so that it can be removed easily. Next, mark the true center of the block at the tailstock end, Fig. 3, detail B, and remount the work in the lathe for turning the outside. When cutting the tapered end free from the waste part, hold the skew chisel with the left hand and the work with the right hand to catch it when severed, Fig. 1. Finally, bore a hole in the wooden plug for inserting a chisel to pry it out.

Rest the thick side at the top of the turning on a 1½-in.-thick block and scribe around the cone with a compass set 1½ in., as in Fig. 6. Then, using this line as a guide, roughly saw the slanted end, finishing it smooth on a sanding disk. Glue a piece of

maple veneer to the rim and carefully trim it flush with the sides after the glue dries. The base of the vase consists of a disk of mahogany and a semicircular disk of maple tenoned and glued to it. The base is attached to the vase by slotting the end to fit over the maple piece. The slot can be cut by supporting the work level, and sawing with a bandsaw or a scrollsaw, gradually widening the slot by trimming the sides.

Before staining and filling the mahogany, apply a coat of shellac to the maple parts to prevent them from absorbing stain. If the work is to be lacquered, give it a coat of sealer first. If you want the vase to hold cut flowers, the inside can be lined with a metal cone. A suitable cone is made by rolling a piece of sheet metal and soldering the seam to make it watertight. Complete the vase by gluing felt to the bottom.



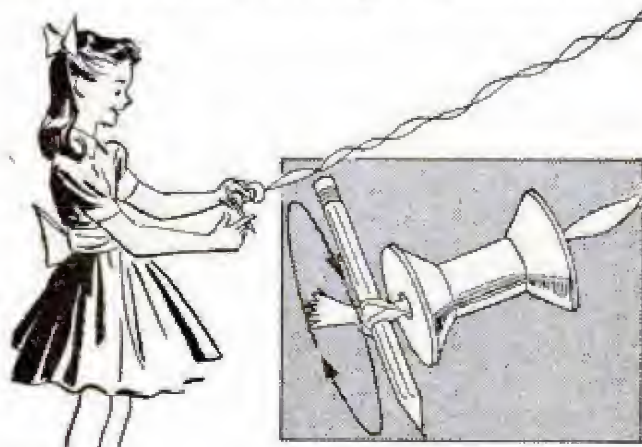
Handy Scraper From Hacksaw Blade Removes Flaked Paint



If you do not have a tool to remove flaked or scaled paint from a surface prior to repainting, one can be made by mounting an old hacksaw blade in a wooden handle. A piece of $\frac{3}{4}$ -in. wood that is wide enough to provide a good grip should be used. One edge of the handle is grooved to hold the hacksaw blade snugly and the other edge is rounded.—W. B. Eagan, Louisville, Ky.

Thread Spool Aids in Twisting Crepe-Paper Streamers

Here's a quick and easy way to twist crepe-paper streamers used for party decorations. Have someone hold one end of a streamer, or fasten it to a wall with a thumbtack. Then, push the other end through the hole in a wooden spool and tie it to a pencil. By holding the spool with one hand and spinning the pencil with a finger of the other hand, the streamer can be twisted as tight as you want it. In addition, two or more streamers of different colors can be twisted together in this man-



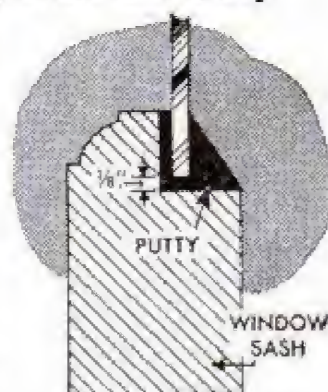
ner, producing a variety of gay color combinations to enhance party atmosphere.

Herbert E. Fey, New Braunfels, Tex.

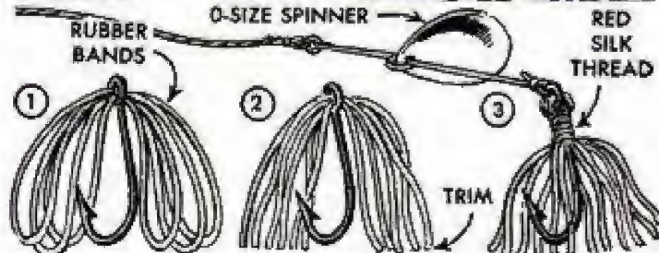
Setting Windowpanes Correctly

When replacing a pane of window glass, it is not advisable to use a pane that fits snugly in the sash, as a tight fit may cause the glass to be cracked when the window is slammed shut. Instead, use a pane of glass that is $\frac{1}{8}$ in. smaller all around than the rabbeted opening in the sash frame. In this way, putty will be forced between the pane and the sash, acting as a shock absorber. This method also will insure a watertight seal.

Jo Ro Jung, New Orleans, La.



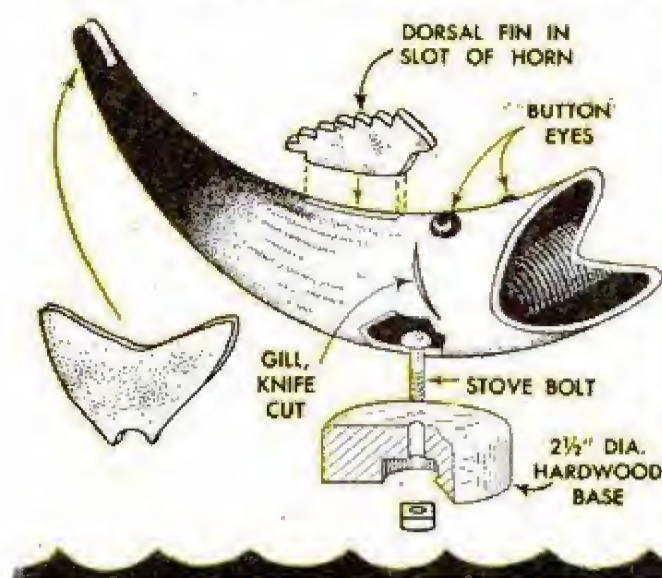
Rubber-Band Lure for Small Fish Simulates Crawling Motion



A good artificial bait for bluegills, crappies or sunfish can be made from several white or natural-color rubber bands and a short-shanked hook. To make the lure, insert the rubber bands through the eye of the hook, detail 1, and trim off their ends as in detail 2. Then, tie the rubber bands to the shank of the hook just below the eye with red silk thread, as in detail 3. The rubber bands impart a crawling motion to the bait. You can increase the attraction of the lure by attaching an O-size spinner to the leader above the bait.

¶To prevent smoking of kerosene lamps, soak the wicks in vinegar before using.

This Horn Fish Swallows" Your Cigarette Ashes



Appropriately dubbed a horn fish, this novel desk ornament is made almost entirely from a cow's horn. Its gaping mouth can be used as an ash tray or to hold paper clips. The mouth is formed by sawing the end of the horn as indicated and the waste piece is saved for the dorsal fin and the tail. Scrape the horn carefully to remove nicks and scratches and also to remove the dull outside layer. Shallow knife cuts are made on each side of the head to represent gills. The waste piece from the mouth is split in half and flattened to make the fin and tail. This is done by placing the pieces in boiling water to make them pliable and then clamping between two pieces of hard-

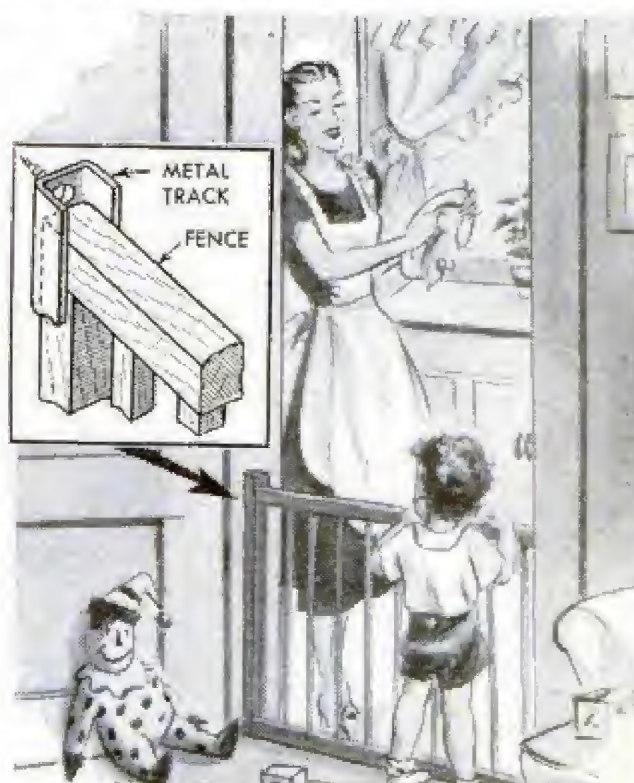
wood, leaving them to dry 8 to 10 hours.

The slot for the fin is made by drilling a row of adjacent holes and then filing the opening square. The tail piece fits in a slot cut in the point of the horn and both the tail and fin are cemented in place. The eyes are plastic buttons cemented in holes drilled large enough to take the button eyelet. A turned disk of fancy wood, nicely finished, forms a base for the novelty. This is attached to the horn with a small stove bolt, the nut being set flush in a counter-bored hole. The bottom of the base is then covered with felt. Finish by polishing the horn to a high luster with paste wax.

Elma Waltner, Hurley, S. D.

Removable Fence Fits Doorway to Keep Baby Penned in Room or Porch

Ideal for keeping the baby out of the way while mother's doing the housework or for safely confining him on the back porch for his daily airing, this handy door fence can be slipped in and out in a jiffy. Any light, but well-constructed, fence is suitable for this purpose, and it is held in place by a metal or wooden track fastened permanently to each side of the doorjamb. The tracks are positioned so they will not interfere with closing the door. This type of gate is particularly safe because there is no latch to unfasten and it is sufficiently heavy to prevent a small child from lifting it out of its track. A fence high enough to keep the baby confined but low enough to permit adults to step over it is recommended. The tracks can be painted to match the woodwork, but the fence itself should be a bright color to prevent someone from accidentally falling over it. Similar tracks can be fastened to several doorways, giving mother a choice of rooms in which the baby can be penned.



SOLVING



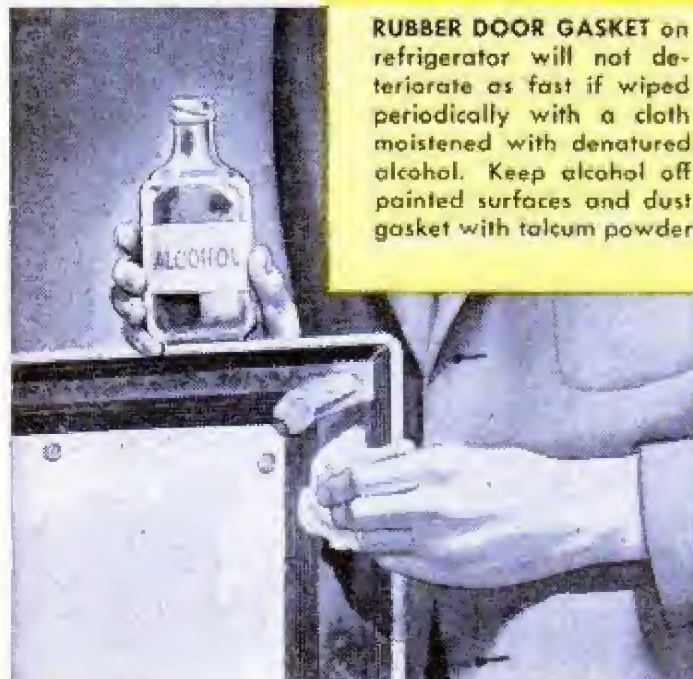
TABLE PLACE MATS which are heat resistant and can be wiped clean are made from colorful linoleum remnants and pieces of plywood. Cement linoleum to plywood, then paint the edges a bright color. Select linoleum having a floral design



IRONING-BOARD HOLDER is improvised from a towel bar to keep board standing upright when stored in a closet. Attach bar to the wall at a height that will allow the ironing board to be slipped under it easily



CHALK FILLS HOLES in plastered walls if the end is pointed and pressed tightly in hole. Then the chalk is sanded flush with the wall, after which it is coated with shellac before touching up or repainting



RUBBER DOOR GASKET on refrigerator will not deteriorate as fast if wiped periodically with a cloth moistened with denatured alcohol. Keep alcohol off painted surfaces and dust gasket with talcum powder



STEP-SAVING TRAY attached to high-chair back is found handy for holding baby's cup, food, toys, etc. Tray is made from scraps of plywood and cut to fit curvature of the chair back before affixing with screws

HOME PROBLEMS

POT-COVER LIFTER for the type which has ring finger grip is another handy use for a spring clothespin. Saves using hot pad and provides a cool handle. Clothespin is snapped to ring to stay upright when in use. May be left on cover permanently or kept in drawer for this purpose



PAINTING FLOWER POTS is simplified by resting them upside down on a suitable-size tin can. Can permits rotating the pot without touching it and provides a good support to hold the pot while drying



TRUE COLOR SAMPLE to carry when shopping for draperies, rugs and other accessories is had by dipping small stick in the paint being used at time of decorating and using as a guide in selecting the right colors



SPONGE TIED TO WRIST can't get away when washing walls or windows and saves getting down from a ladder when it pops from your hand. Speeds work, freeing hand for chamois. Sew string through sponge

NONSLIP GRIP for bottle of bleaching fluid is simply a man's sock placed over the bottle. The sock also serves as a jacket to catch any liquid that runs down the outside of the bottle, preventing table-top stains



Fishing-Lure Holder for Boat Hooks Over Gunwale

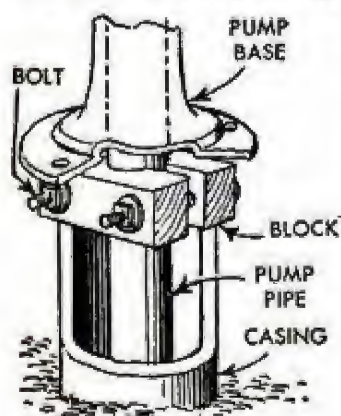


Fishing lures will be at your finger tips for quick selection if they are hung on a rack suspended from the side of the boat. To make the rack, turn several L-hooks into the edge of a piece of scrap wood and staple two lengths of heavy wire to its top. The wires are bent to hook over the gunwale of the boat. Coat hangers provide excellent wire for this purpose.

Infrared Lamp Loosens Paint

Instead of using a blowtorch to loosen paint for removal with a putty knife, Henry A. Wallis of Brooklyn, N. Y., uses an infrared heat lamp. The lamp is effective and safe to use indoors and does not produce smoke or irritating fumes.

Block Clamp on Pump Pipe Prevents Dropping in Well



After prolonged periods of use, a pump pipe sometimes will work loose and fall into the well, necessitating the difficult job of fishing it out. A good way to prevent this trouble is to clamp the pipe so it will not drop even though it does

work loose. To do this, notch two hardwood blocks to fit around the pipe and drill them for two bolts. The blocks should be large enough to rest on top of the casing

and when notching them, be sure they will grip the pipe securely. To attach the clamp, the pump and pipe, of course, must be raised slightly above the well platform.

W. B. Kennedy, McCool, Miss.

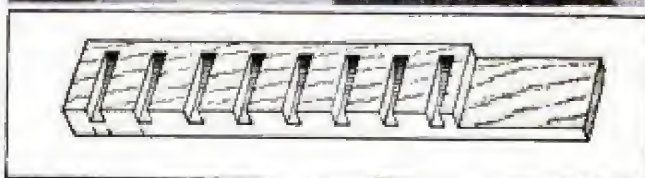
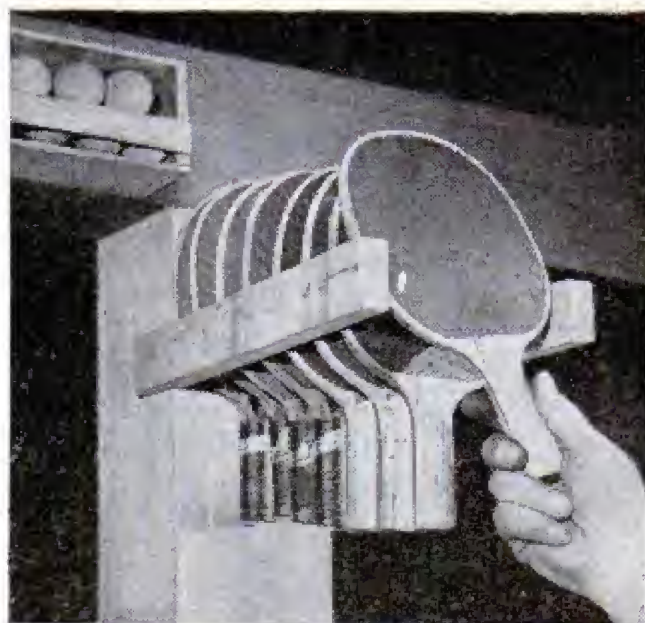
Retouching Marred Furniture

Here is an excellent way to touch up scuffed places and off-color spots on your furniture. First, obtain a tube of ground-in-oil color to match the finish. With the tip of the finger apply white shellac to the spot. Then, again with the finger, immediately daub a little of the color on the shellac. The shellac binds the color and both will dry together in a very short time. If there are many scratches, go over the entire surface with a coat of shellac, varnish or furniture polish. A good furniture polish can be made by mixing linseed oil, 2 parts, and turpentine, 1 part. Use a soft, lintless cloth to apply the polish to the surface.

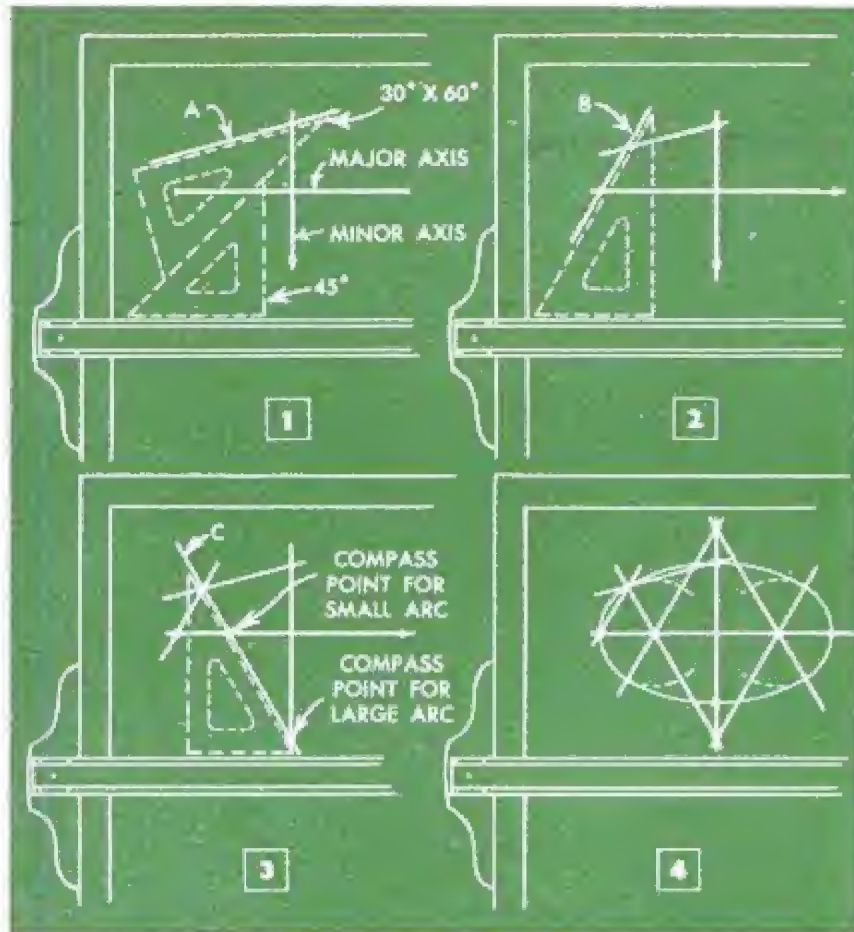
Francis W. Henry, Pottsville, Pa.

Rack Holds Table-Tennis Paddles

Two wooden arms fastened to a post in the basement recreation room provide a handy rack for table-tennis paddles. The arms are notched with a dado cutter or with a circular saw, and if the latter is used, the material between the cuts is removed with successive side-by-side passes of the work over the blade. One end of each arm is rabbeted so that when the arms are attached to a post the widest part of each paddle will fit snugly in the stopped grooves as shown.—Frank P. Fritz, Cicero, Ill.



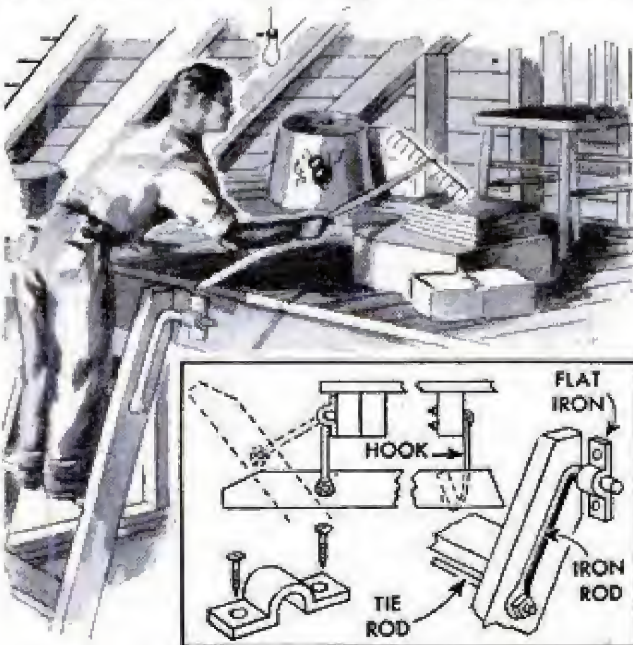
Drawing Ellipses With a Compass and Triangles



Here is an accurate method for drawing an ellipse suggested and explained in four simple steps by H. Drouyn, of Ottawa, Can. First, draw a major and a minor axis of a given length. Then, with a 30-60-deg. and a 45-deg. triangle placed as shown, draw line A, step 1. Next, from one end of the major axis draw line B with a 30-60-deg. triangle, step 2, to intersect line A. In step

3, a third line, C, is drawn from the point where lines A and B intersect, using a 30-60-deg. triangle placed in a reverse position. This establishes compass points for drawing the small and large radii of the ellipse. Finally, step 4, locate compass points in the same manner on each side of both axes and then complete the ellipse by swinging the circles.

Retractable Garage Ladder Is Stored by Folding Under Attic Floor



Storage space in the attics of larger garages often is not fully utilized because of the inconvenience of using a conventional ladder to gain access to it. However, this space can be reached with little difficulty and used to maximum advantage if a lightweight, yet sturdy, ladder is hinged to a joist as shown in the detail. Mounted in this manner, the ladder swings up under the floor and out of the way when not in use. It is held in the retracted position with a heavy wire hook stapled or fastened with a U-bolt to a joist.

Willard Midby, Billings, Mont.

Less time is required to hang a washing outdoors when cold weather makes the fingers tingle, if socks, handkerchiefs, etc., are first hung on wire coat hangers while indoors and then hung outside.



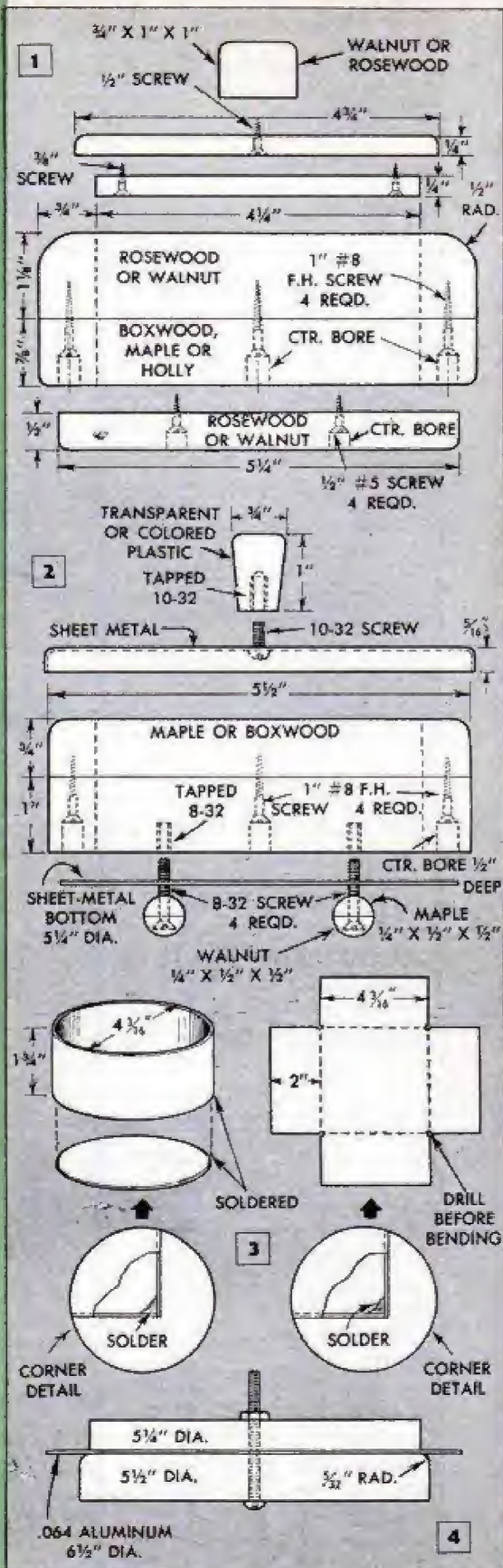
This box is built up of six parts cut square from contrasting woods and stacked alternately in order shown



Here, cover of aluminum is combined with two-tone base which is fitted with four ball feet of wood or plastic



Both boxes make attractive plant holders. This requires a metal container to be made to fit the shape of the box



NOVELTY BOXES

THESE novel candy and trinket boxes of contrasting woods will appeal to the inexperienced craftsman, as they are simple enough to complete in an evening or two with a few hand tools.

The square box, Fig. 1, consists of five blocks of contrasting woods and a knob, stacked in bread-and-butter fashion. The centers are cut from the two blocks that form the main part of the box and the end grain of these two blocks is placed at right angles to each other when gluing and screwing them together. In making up the two-part lid, be sure that the screws which are used to fasten the bottom piece do not pierce the upper face of the top piece. Note that the knob must be fastened to the lid before the bottom piece is attached.

The cover for the circular box, Fig. 2, is made of sheet aluminum and this part is formed first. This is done over a wooden form consisting of two disks, Fig. 4, one being of maple with the edge rounded and the other of pine and slightly smaller. A disk of soft sheet aluminum is sandwiched between the two wooden disks and then all three parts are drilled in the center and clamped together with a bolt. Now, the extending edge of the aluminum is hammered down over the edge of the maple disk, using a softwood block to prevent marring. In forming the edge, the metal will wrinkle, but inasmuch as the metal disk is oversize, this portion is trimmed off. If desired, a



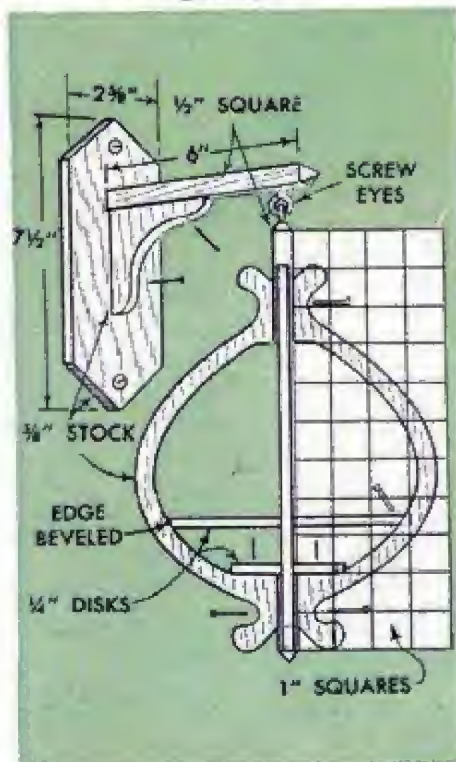
Spun finish is applied to metal cover by mounting work and wooden form in lathe or drill chuck and polishing with fine steel wool while work is spinning

spun finish can be applied to the cover. The bolt is reversed, chucked and then the aluminum is polished with fine steel wool.

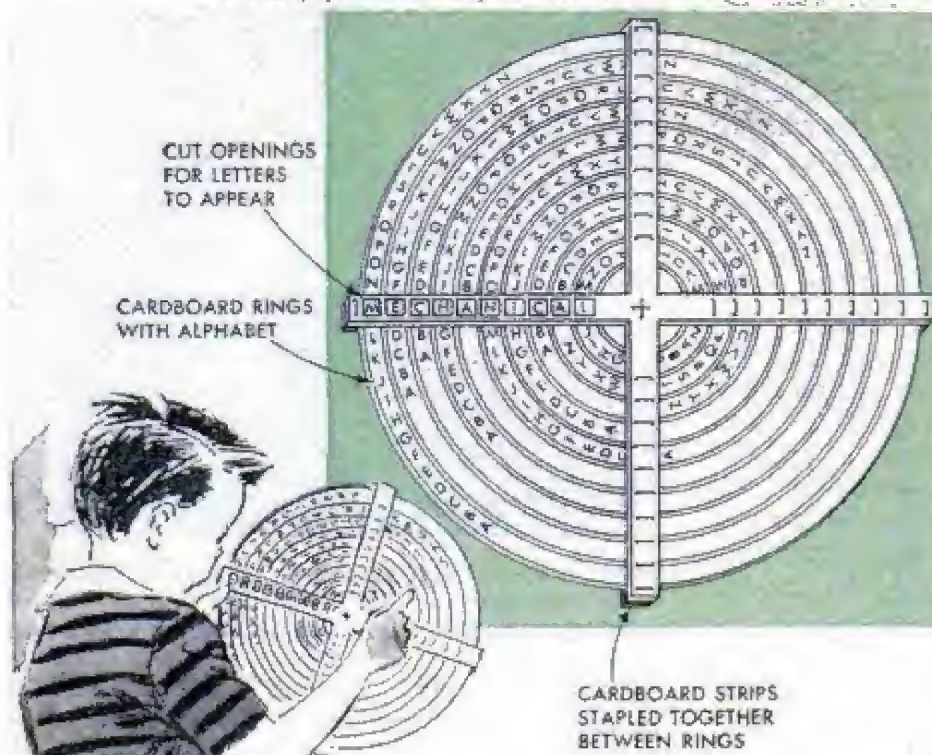
The maple disk forms the upper half of the box, and after sawing out its center, it is screwed to a walnut disk of the same size which also has the center cut out. The bottom of the box is covered with an aluminum disk and wooden or plastic ball feet are fastened to the bottom of the box through holes in the metal disk. A plastic knob is attached to the aluminum cover. If the boxes are to be used to hold small plants, a metal liner, Fig. 3, is cut and soldered together to fit the box loosely.

Pin-Up Bracket Provides Hanging Holder for Ivy or Potted Plant

Here's an attractive little project that can be produced with your jigsaw alone. It's cut from plywood, with $\frac{1}{2}$ -in. solid stock being used for the arm of the bracket and the parts to which the scrolled pieces are nailed. Jigsaw the latter, following a pattern drawn full size. After nailing the four pieces together to form a cage, cut and nail the two circular shelves in place. This part of the complete plant holder is suspended from the wall bracket with two screw eyes by opening one of the eyes to engage the other and then closing it by squeezing with pliers.



Amusing and Educating Spelling Game Provides Hours of Worthwhile Fun



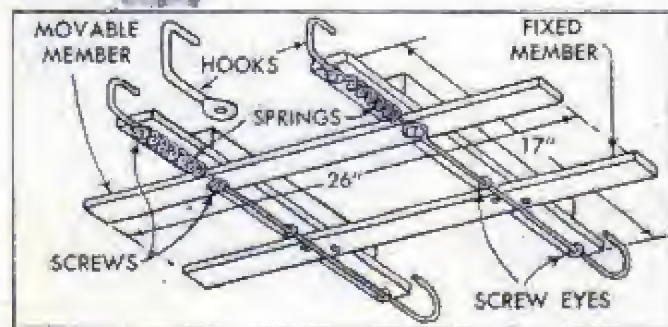
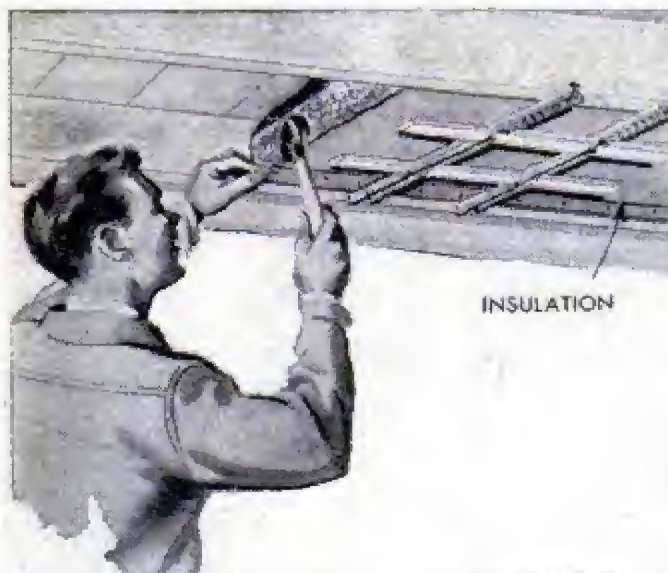
Whether amusing himself alone or playing with other children, the youngster of school age will have hours of educational fun with this unusual spelling game. When the rings are rotated in the frame, letters of the alphabet printed on the rings appear in the windows cut in one of the cross members. The rings are cut from heavy cardboard and the frame, also of cardboard, consists of front and back strips stapled together in the form of a cross. The rings are held in place and spaced to align with the windows by inserting staples between them through the arms of the frame.—Opie Read, Jr., Chicago.

Frame Holds Batt-Type Insulation Overhead to Free Hands for Nailing

When converting an attic into extra rooms, and it is impossible to insulate the ceiling from above, this self-gripping frame holds batt-type insulation in place and frees both hands for nailing. In use, the batt is rested on the frame and raised into position. Then, the fixed and movable members of the frame are grasped with one

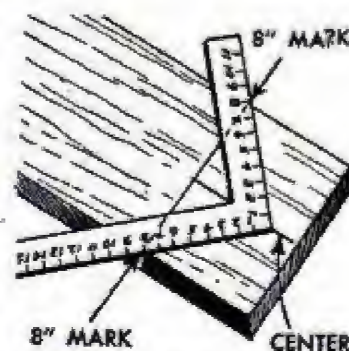
hand and squeezed together. This spreads the hooks apart so they will slip over the outer faces of the joists. When the parts are released, the hooks grip the joists, holding the frame and consequently the batt in place. The frame consists of wooden strips, two springs, and hooks bent from wire clothes hangers. The movable member is not screwed to the frame as it is supported by the long hooks which run through screw eyes turned into the cross members. The dimensions given in the detail can be varied to suit the spacing of the joists. Note that blocks are fitted to the upper side of the frame to raise the batt into nailing position. Frame is moved as nailing progresses.

Robert N. Abild, New Britain, Conn.



Dividing a Board in Half

Many carpenters locate the center of a board quickly by using a square in the following manner. First, a line is drawn across the board perpendicular to its edges. Then the square is placed on the board so that the reading is identical where each leg of the square intersects the line at the edge of the board. When this has been done, the corner of the square is at the exact center of the board.





Although ceramics, or pottery making, is one of the oldest of the arts, hobbyists still can turn a neat profit from custom work in their own original designs. Anyone can build the necessary equipment at small initial cost

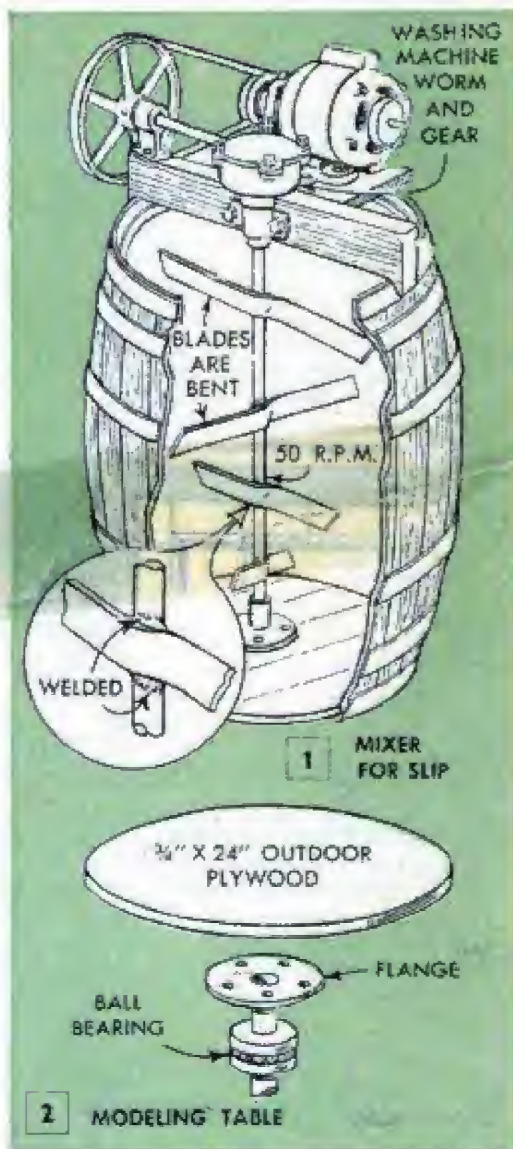
CERAMICS

By
Hi Sibley

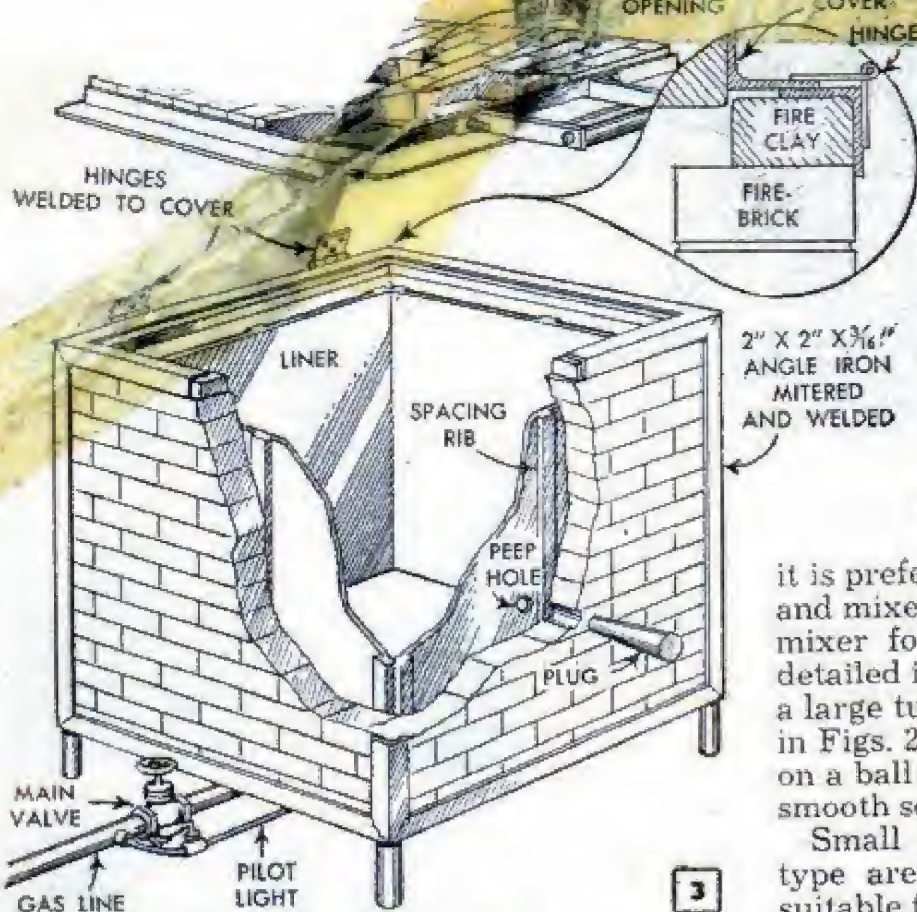
AS OUTLINED by Miss Jane Poyer, nationally known authority on ceramic sculpture, there are two methods of making pottery. One method is casting in plaster molds and the other is turning or throwing on a potter's wheel. The former process permits a great variety of design ranging from a simple dish to intricate groups of figures. Also, there are many minor variations of both processes. In casting, a clay model of the subject is first made and plaster of paris is poured over it to form a two-part mold. For the more intricate shapes the mold is often made in several parts. When the plaster has set, the mold is opened and the model removed. The mold is again assembled and is filled with liquid clay, or slip. When this has set or solidified sufficiently to hold its shape, the mold is again opened and the clay casting removed. Rough edges are carefully scraped off and the entire surface of the casting is smoothed with a wet sponge. Then it is placed in a kiln for bisque or hard firing. Following this, color is applied with brush or spray, the piece is dipped in a glaze solution and is then glaze-fired in the kiln, giving it the glossy surface of the finished product. In the process of throwing on the potter's wheel, the object is shaped freehand without use of either a pattern or mold.

For general work in ceramics the hand tools required are spatulas, scrapers, a sharp-pointed knife, several soft brushes, a spray gun, and a mortar and pestle for mixing colors. If the firing is done in a home kiln, special kiln furniture will be needed such as shelves, shelf supports and saddles and stilts on which the work is supported while being fired.

Modeling clay can be purchased from dealers already prepared for use, or it may be prepared by the user from the raw clay. Liquid clay or slip also can be obtained from dealers, but if required in quantity,



An efficient mixer for slip is made from a hardwood barrel and a reduction gear from an old washing machine. At top of page, Miss Poyer, nationally known ceramics artist, with examples of her work



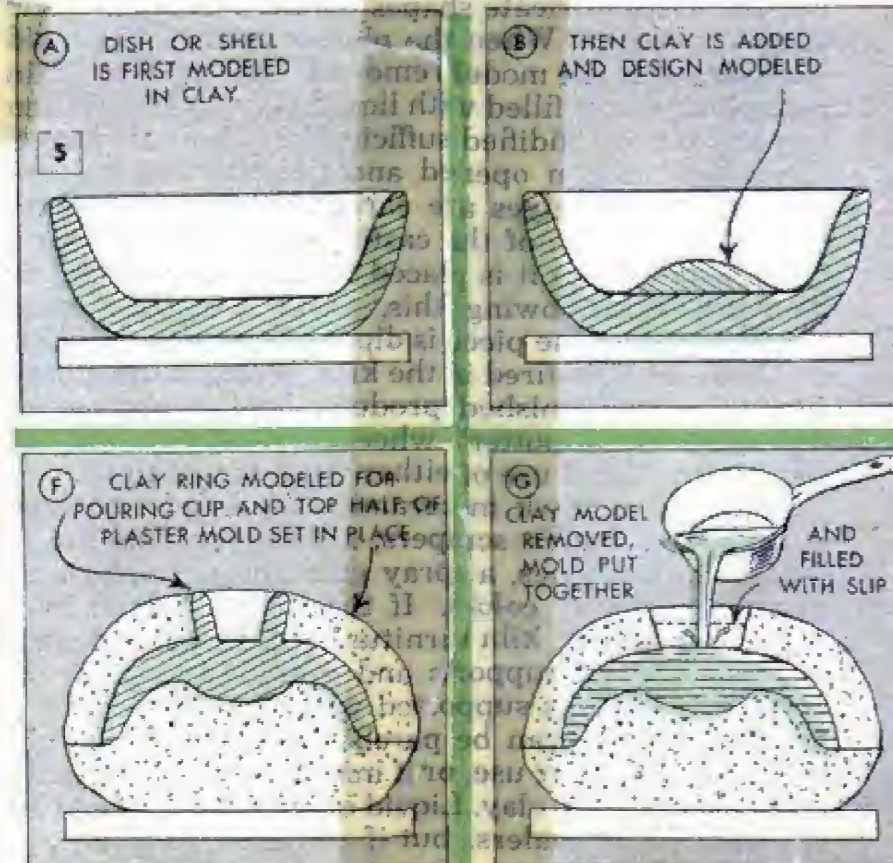
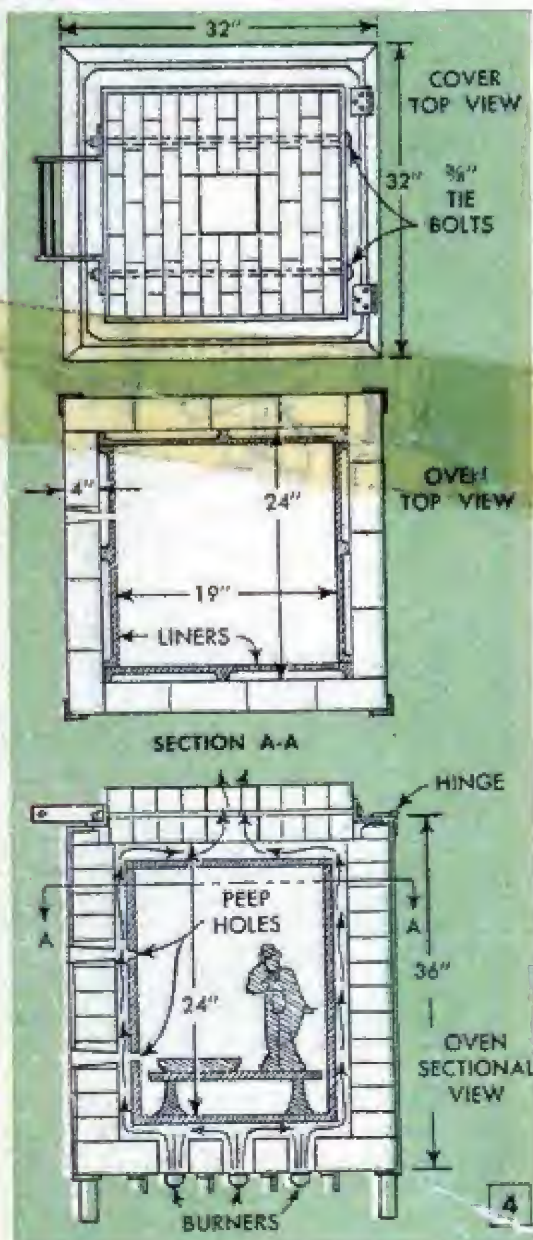
Wooden spatula is used to smooth clay after it is modeled to shape

it is preferably purchased as a powder and mixed as needed. A motor-driven mixer for large quantities of slip is detailed in Fig. 1. Modeling is done on a large turntable, such as that detailed in Figs. 2 and 6. The table is mounted on a ball bearing and its top should be smooth so that it can be cleaned easily.

Small electric kilns of the bench type are convenient to use and are suitable for firing small pieces. A gas-fired kiln, for commercial production,

is detailed in Figs. 3 and 4. It consists of a firebrick shell set in a frame made from angle iron. An inner shell is formed from fire-clay liners and heat from the eight gas burners passes between the liner and the outer wall, and out the opening in the lid, Fig. 3.

The step-by-step process of making a piece of cast pottery is shown in details A to J inclusive, Fig. 5. First, the modeling clay is kneaded on a plaster-of-paris slab, or batt, and the piece, designed in sea-





Plaster is brushed on lower half of mold. Coating must be uniform



Clay ring makes pouring cup on bottom of shell. Ring is removed

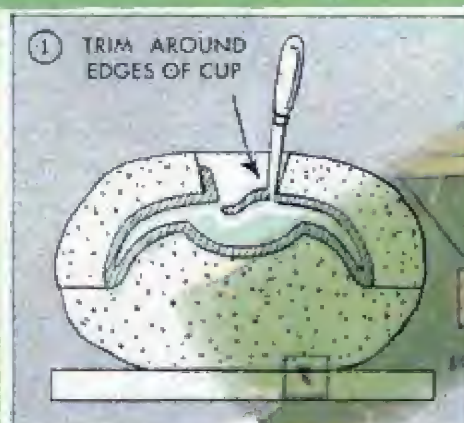
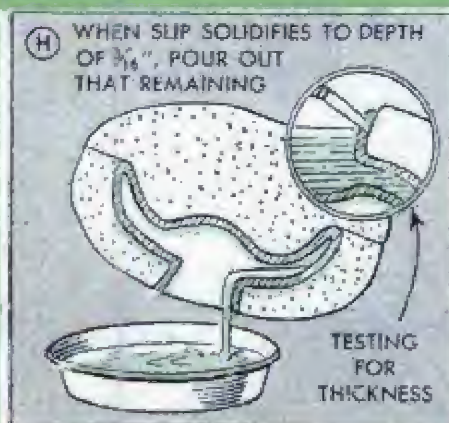
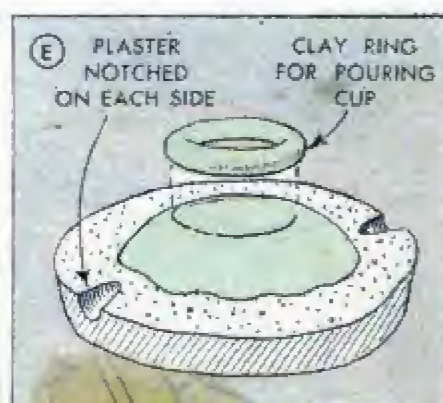
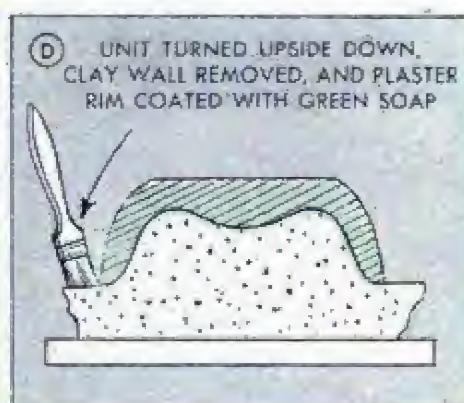
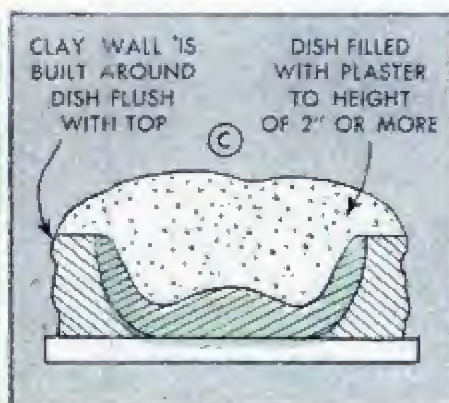


After trimming at the joint, mold is pried open and shell removed

shell motif with a fish ornament at the center, is roughly shaped with the hands on the turntable to the sectional shape shown at A. Then, a clay roll is added to the bottom from which the fish is to be modeled. Both shell and fish are gradually molded into shape with the fingers, which are kept moist with a sponge. Wooden spatulas and wire cutting tools are used in the finish modeling of both parts. Plaster of paris is brushed over the surface and a clay wall is built around and under the shell and brought up flush with the rim. Then build up the plaster on the model until about 2 in. thick, detail C, as a thinner mold will not absorb moisture sufficiently to dry the casting properly. In preparing plaster of paris, pour the dry powder into a basin of water until an island is formed. When this absorbs the water and begins to settle, mix with the hands, squeezing out the lumps.

Now turn the piece upside down, detail D, remove the clay wall around the shell, and apply either a plaster separator or green soap to the rim of the plaster so that the fresh plaster of the other half of the mold will not adhere. Notch the edges on opposite sides so that the two halves can be fitted together again in exact register. Make a clay ring and place it on the bottom of the model, detail E. This is formed into a pouring cup.

Build up the second half of the plaster mold as in detail F. When it has hardened, trim around the joint with a knife and carefully pry the mold open. Remove the clay model or pattern, clean the mold and put it together again. The halves are held in place with strong rubber bands, Fig. 6. Slip is now poured in as in detail G until it fills the mold nearly to the top of the pouring cup. As the plaster mold absorbs

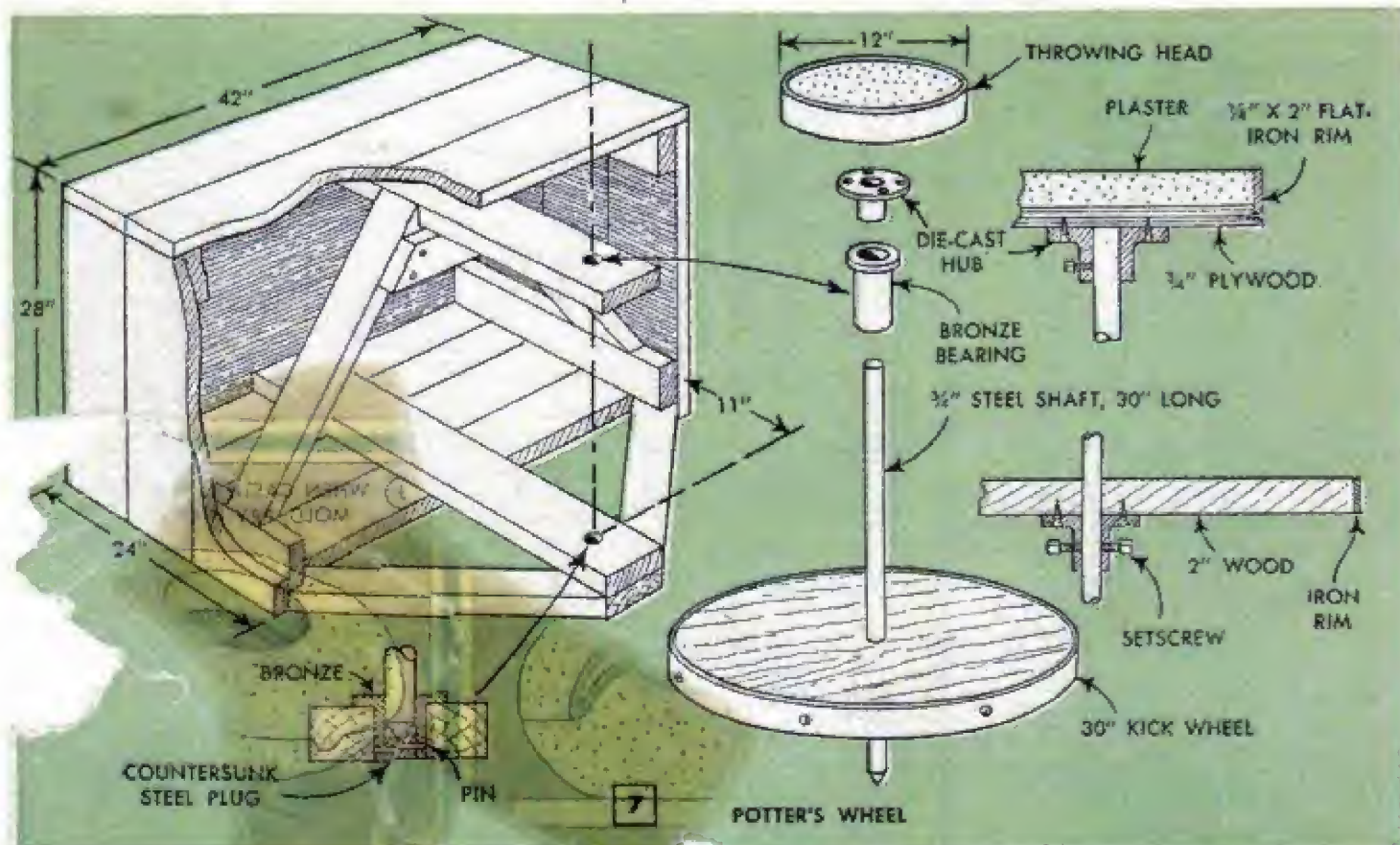




Left, mold is assembled and slip is poured in. Above, after bisque firing and coloring, piece is dipped in glaze

water rapidly, the slip in contact with it will solidify and the level of the slip in the cup will recede. After it has gone down $\frac{1}{4}$ in. or so, make a knife cut near the top, detail H, to test for thickness and when the solidified slip is from $\frac{1}{8}$ to $\frac{1}{4}$ in. thick, invert the mold and pour out the unsolidified slip. Now carefully trim around the edges of the cup, as in detail I, so that the mold can be opened without breaking the shell-like casting, which shrinks away from the mold sufficiently so that removal will be comparatively easy when the mold is opened. Castings with thin edges should be removed with care to avoid breakage.

Finally pry the mold open with a knife blade and lift out the casting very carefully. Scrape off any fins and smooth the piece with a damp sponge. It is now ready for bisque or hard firing and is placed in the kiln on stilts to raise it off the floor. Pyrometric cones, Fig. 8 are placed just opposite the peephole. These are numbered for various temperatures and the cone marked 04 is used for bisque as it bends or "wilts" at 1922 deg. F. The cone becomes red hot and is easily seen in the dark interior of the kiln through the peephole. When it begins to bend, the heat is turned off. Length of firing time depends on the



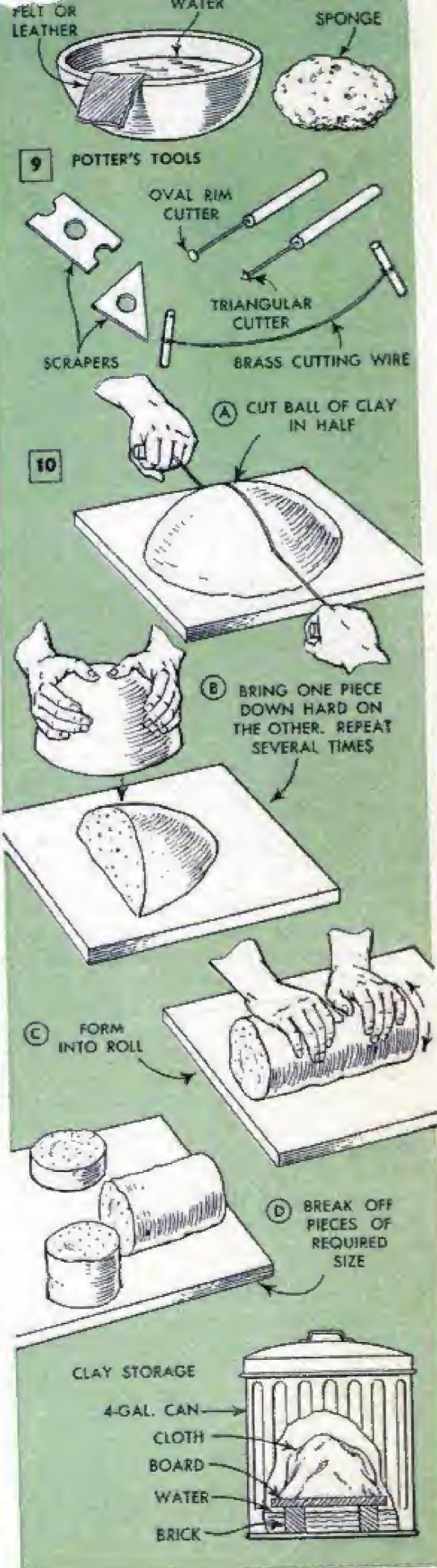


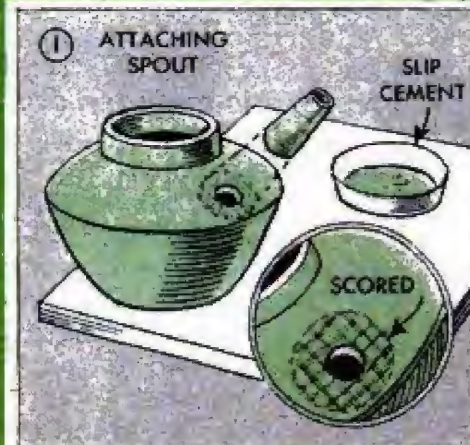
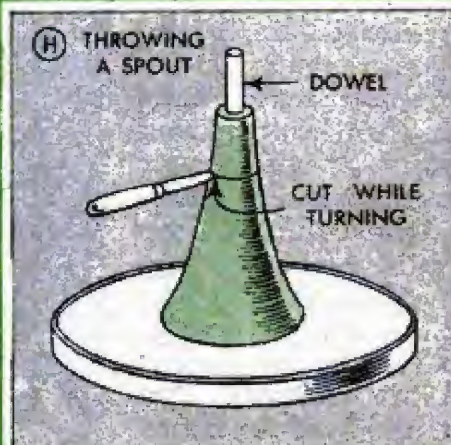
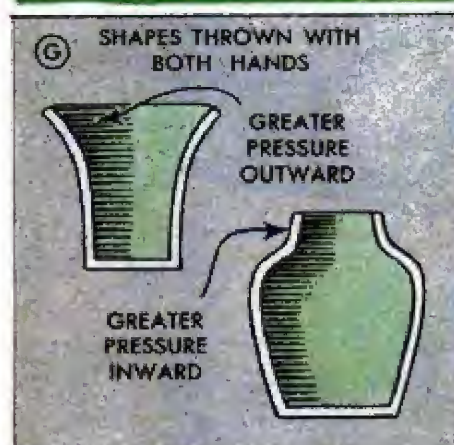
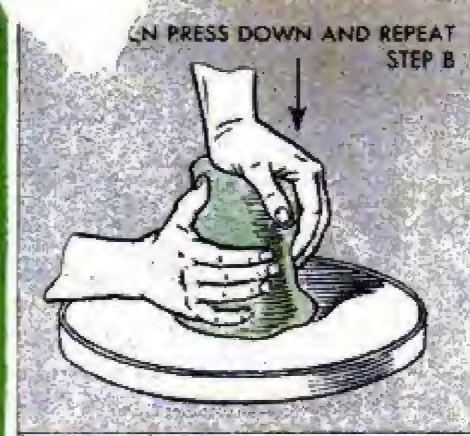
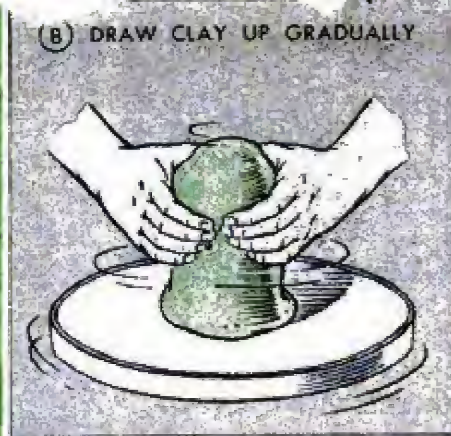
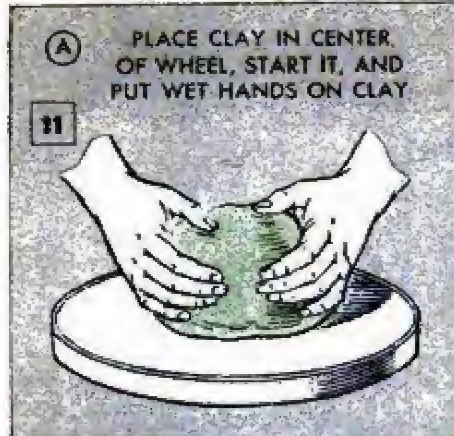
gas pressure, the type of kiln used and other factors. In regular practice, the heat is turned on at lowest adjustment for two hours or so to warm the kiln. Then it is turned up full. Four to eight hours at full heat are required in hard firing.

Coloring with engobe, or colored slip, is the next step. The colored engobe comes in dry form and is prepared according to the directions supplied. Engobe is laid on in a uniform coating but is not brushed out like paint. It will appear flat and colorless before firing, but the application of heat brings out the true color. Colors also are applied with a spray gun. After coloring, the glaze solution is applied, either by spraying or dipping. In dipping, the piece is immersed in the solution, and the portions held by the fingers are later painted over with the solution. The piece is now placed in the kiln and fired for about an hour to set the glaze and impart a glossy finish.

In its simplest form the potter's wheel consists of a rotating disk propelled by means of a kick wheel. A refinement is the electrically driven wheel with variable speeds. A simple design employing the kick wheel is shown in Fig. 7. Essential features are a strongly braced frame, with an easy-turning kick wheel and throwing head, or disk, upon which the subject is modeled. Distance between top of bench and kick wheel either should be adjustable or fixed at the most convenient and comfortable height for the operator, who straddles the shaft and rotates the wheel by a forward motion with the right foot and backward with the left, the motion being from the knees downward. Construction details are shown in Fig. 7, 2-in. material being used throughout to make a rigid structure. The two shaft bearings are flanged bronze sleeves, the lower one having a countersunk plug of brass or cast iron on which the shaft rotates. Ordinarily, the kick wheel is made from wood with a heavy iron rim, or tire, to give the effect of a flywheel. For the throwing head, many potters prefer a plaster surface as the clay adheres well and surplus moisture is absorbed. This type is made with an outdoor-plywood bottom fitted with a sheet-metal rim. When assembled the head is filled to the top of the rim with plaster of paris. Both disk and kick wheel are fastened to the shaft with flanges, the lower one being adjustable by means of setscrews.

Other necessary equipment is illustrated in Fig. 9. The bowl of water always contains a piece of leather or felt for smoothing clay on the wheel. The other items are a sponge, cloth, two brass scrapers, an oval and a triangular rim cutter,





and a brass cutting wire with two wooden handles. Some potters prefer to dig and prepare the clay themselves. Others purchase refined clay from dealers to save time and labor. Clay freshly dug from the pit should be seasoned through the winter. Then, the clay is powdered and mixed with water until it is thin enough to pass through a fine sieve into a large container. It is allowed to settle for several days, then the excess water is poured off. When dry enough to handle, spread it on a clean floor and allow to dry until stiff enough to knead. This can be done by hand, with the bare feet or in a pugmill. Further seasoning in a cool, damp place will improve its quality. Unused clay is kept in a covered can with about 2 in. of water in the bottom. The clay is placed on a board supported above the water on bricks. A cloth is then thrown over the mass, with the ends in the water.

Fig. 10, details A to D inclusive, shows how to prepare clay for the wheel. Work it into a ball the size of a round loaf of bread and place on a clean board. Cut in half with the brass wire, A. Then pick up one piece and bring it down hard on the other as at B. This is known as wedging. Repeat several times, finally forming the mass into a roll, C. Break off pieces of the sizes required, D, and mold them into balls.

In throwing a simple dish, a clay ball is placed firmly in the center of the throwing head, Fig. 11, and the hands are dipped in water. Start the wheel in motion and cup the hands over the clay, pressing down on

the disk, A. Now draw the clay upward with a slight pressure of the hands as at B, and then force it down again with the palm of the left hand. Repeat several times, detail C. This aids in conditioning the clay. Press both thumbs down in the center of the rotating mass to start a hollow, or depression. Widen this by inserting fingers of the left hand, D. Continue widening the hollow by using both hands, at the same time manipulating the rim with the fingers to bring it to the required thickness and height. Ridges are rubbed out with the fingers and a piece of wet felt, and the rim is smoothed with the square scraper, as in E. The knack of forming the clay into the various shapes is easily acquired after a little practice. Cutting the work from the throwing head is done as in detail F. When cutting work from the throwing head with the wire be sure to hold the wire taut as it may loop or kink and cause damage.

Throwing vases and jugs calls for much the same procedure, except that a larger ball of clay is used and the sides are drawn higher. Details G to L inclusive, Fig. 11, show the common technique quite clearly. For making the outward flare of a vase, simply exert greater pressure with the fingers of the left hand inside the rim than with the thumb of the same hand on the outside. The reverse movement shapes the curve in a jug, or teapot, as in G. The spout for a teapot is made by throwing a clay cone around a dowel and cutting it off at the required length with a knife while the

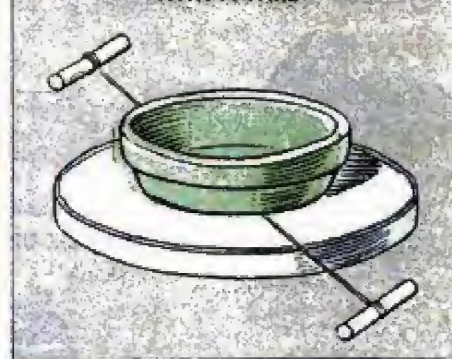
D START DEPRESSION IN CENTER WITH THUMBS AND FORM A RIM AS BELOW



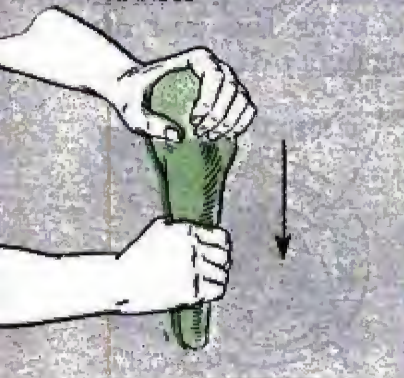
E SMOOTH THE RIM WITH A SCRAPER



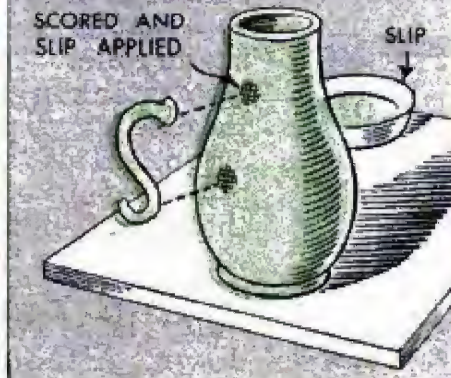
F CUT SAUCER FROM THROWING HEAD WITH A WIRE



J DRAWING CLAY FOR HANDLE



K ATTACHING HANDLE



L FORMING A LIP



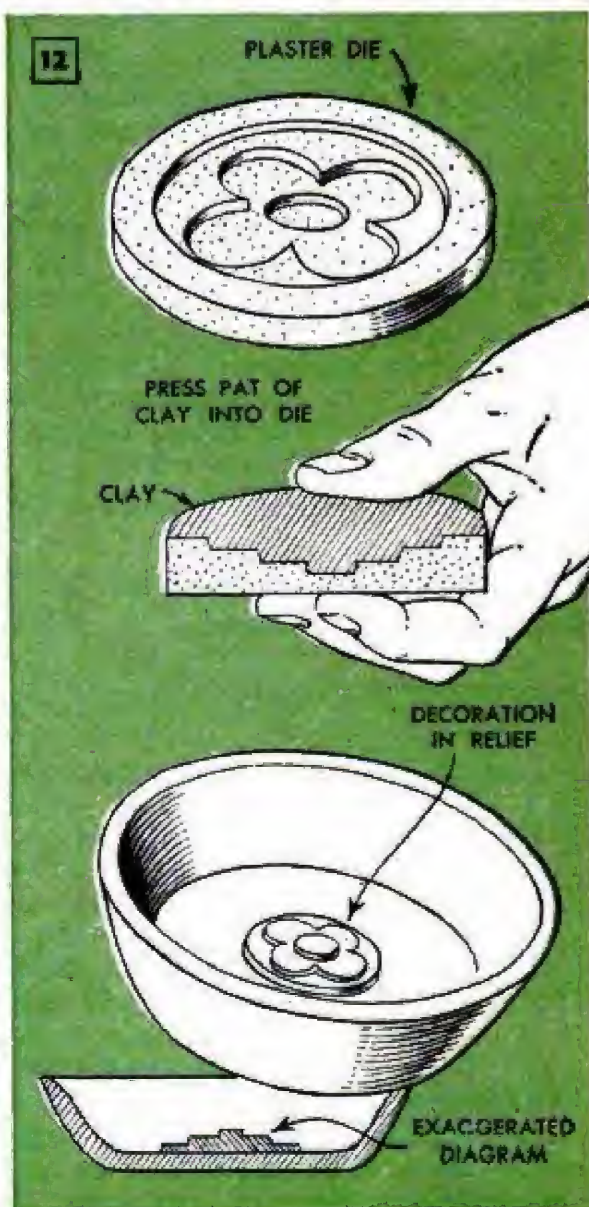
work is in motion, as at H. A hole is then cut in the pot the size of the dowel. The clay around the hole is scored and slip is applied, which acts as a cement when the spout is gently pressed against the pot, as in detail I. To make handles, start with a pear-shaped ball of clay, as in detail J. Hold the clay in the left hand, wet the right hand and gradually draw a long, conical shape. Then, without using any pressure from the thumb, draw out the shape with the fingers to the size required. The handle is bent to shape and the ends are flattened as shown in detail K. It is then attached to the pot with slip in the same manner as the spout. To form a pouring lip on a jug or vase, work with the index finger of the left hand inside and thumb and index finger of the right hand on the outside, as in detail L. Procedures in coloring, firing and glazing are the same as used when processing castings.

Overlay decorations are applied by means of plaster dies, Fig. 12. A pat of clay is pressed into the die, the excess scraped flush with a straight-edge, and the die with the clay in it is pressed against the surface of the work.

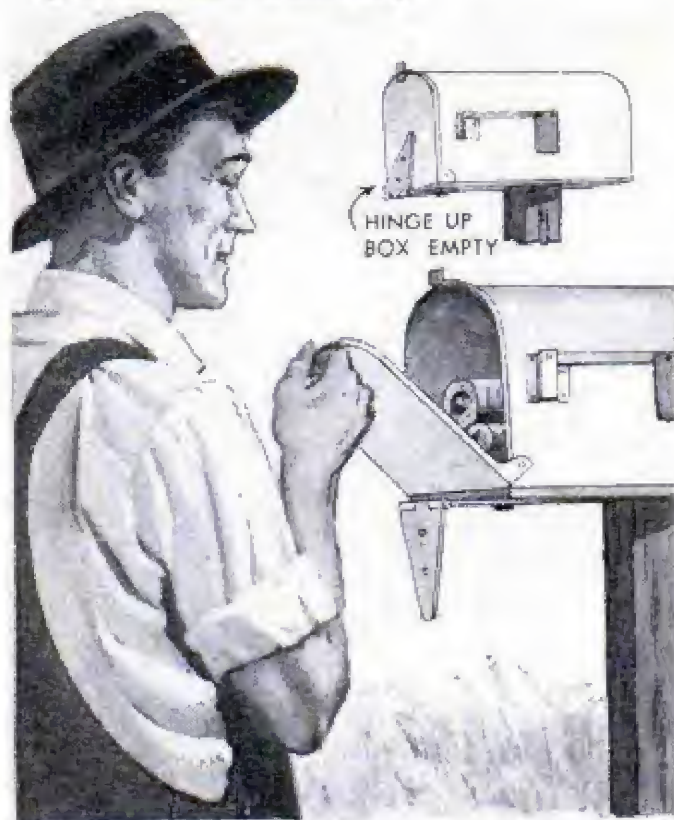
"Canned" Ice for Picnics

Ice frozen in empty beverage cans may be carried with perishable picnic foods in any closed container. Cans which have been punctured with the special opener are most suitable. These are filled with water almost to the top and placed in the freezing compartment of the refrigerator. Wax paper held with a rubber band seals the top of the can.

A. H. Parks, Bloomfield, N. J.



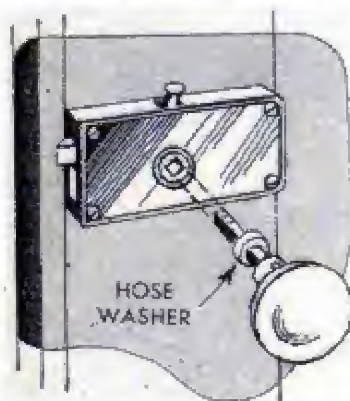
Signal on Bottom of Mailbox Signals Mail Delivery



To eliminate unnecessary trips to my mailbox, I devised this automatic signal which shows when mail has been delivered. It consists of a barn-door hinge, screwed to the bottom of the box, so that the hinge barrel projects about $\frac{1}{2}$ in. from the front of the box, permitting the leaf to be propped up against the door. After I remove the mail from the box, I prop the hinge upright, and when the postman opens the box later to deposit mail, the hinge drops down. As my mailbox faces the house, I painted the hinge leaf bright red so it can be seen from the window.

Joseph Amorose, Richmond, Va.

Doorknob Rattle Silenced With Rubber Washer



Although thin washers usually are provided to take up end play in the knobs of a rim-type door lock, wear often causes the knobs to become loose and produce an annoying rattle. If this occurs, a rubber washer slipped

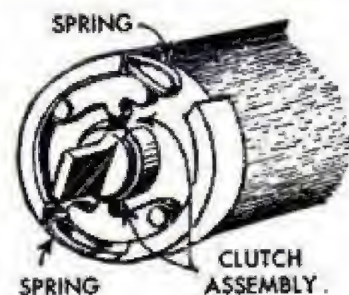
over the square shank, as shown, will effectively stop the noise. A small-size hose washer will do, or one can be cut from a piece of sheet rubber or inner tube. In re-

placing the knob, it will be necessary to press the knob against the washer to compress it so that the original setscrew hole in the shank can be used.

A. H. Waychoff, Phoenix, Ariz.

Slipping Window-Shade Clutch Corrected by Small Springs

If a window shade snaps up to the roller without warning, or is difficult to stop where you want it, chances are that the clutch assembly has become worn. This condition can be remedied by installing a small, U-shaped spring between the outside edge of each clutch dog and the metal cap that is pressed over the end of the shade roller. The springs prevent the dogs from sticking in the disengaged position, and also apply pressure to them to facilitate engaging the notches as the roller is slowed down. Although almost any thin spring material

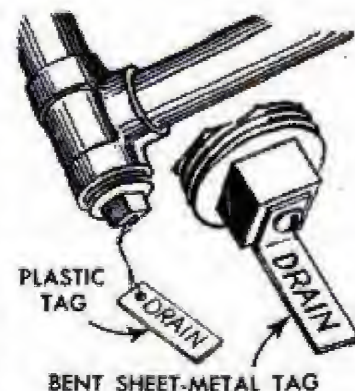


will do, phosphor bronze is the best for this purpose, and the springs should be cut narrow enough so they will not bind between the side of the cap and the face of the clutch assembly. The springs are installed by bending up the overlapped edge of the metal cap near the end of each dog to permit inserting a spring, as shown. Then, when the cap is bent back in place, it is dented at the looped end of each spring.

Wm. E. Danneman, Chicago.

Tags Aid in Locating Drain Plugs

Inconspicuous drain plugs at key points in a plumbing system are likely to be overlooked when the system is serviced by persons unfamiliar with it. For this reason, it's a good idea to attach a sheet-metal or plastic tag to each



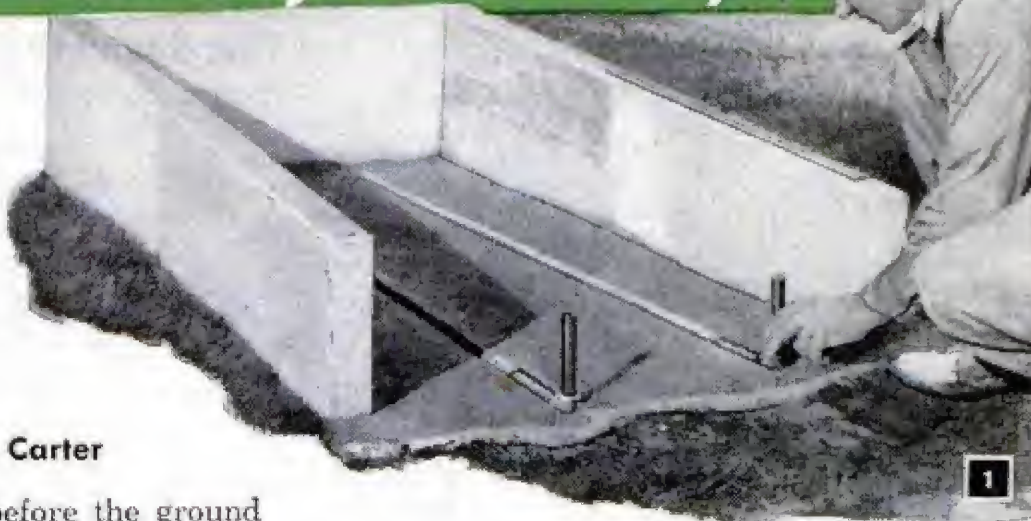
plug. If the tags are painted in bright colors with contrasting lettering, they will be easy to locate. The plugs are drilled and tapped to take a small machine screw which is used to fasten the tag. The plastic tag is wired to the screw, but the sheet-metal tag is attached directly to the plug.

J. Modroch, Danbury, Conn.

CONCRETE HOTBEDS

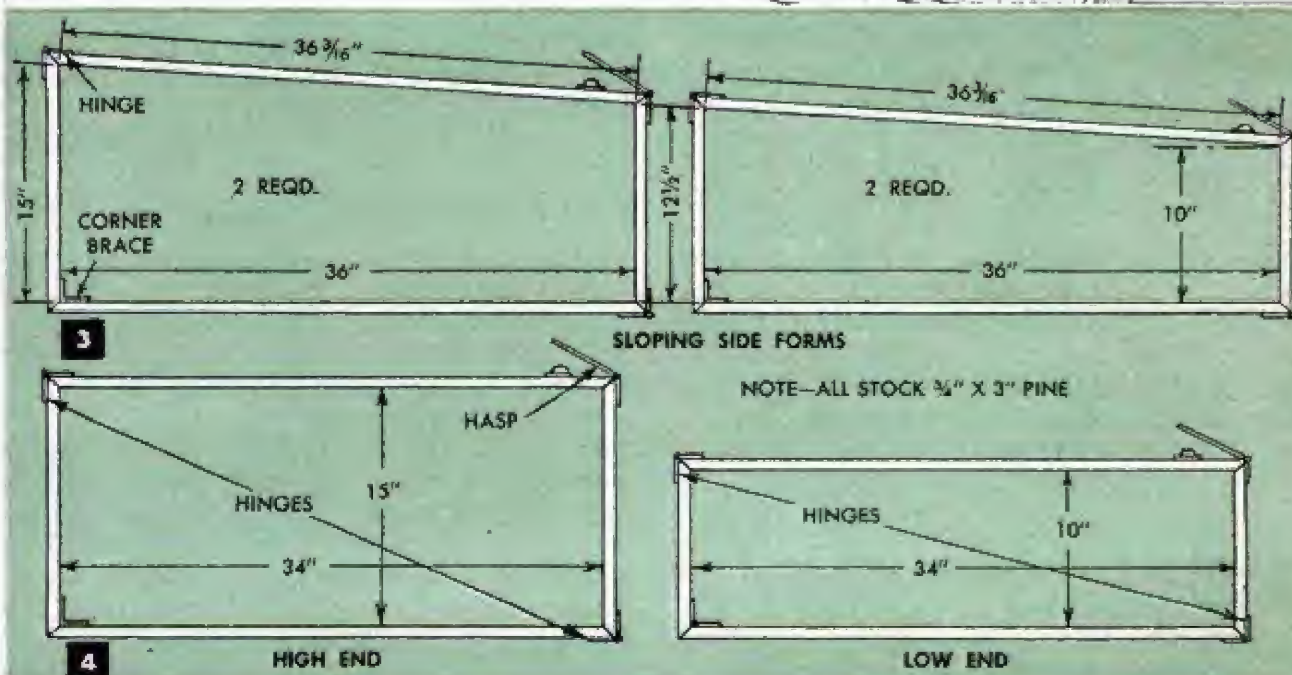
provide subsurface watering

At right is the installation for the subsurface watering of concrete hotbeds. Watering channels are formed by pressing a length of 2-in. pipe into concrete



By J. F. Carter

RIGHT NOW, before the ground freezes, is the time to build concrete hotbeds. First make hinged forms as in Figs. 3 and 4. Diagonal corners on each form are hinged so that a side and one end open outward. On the upper left-hand corners of both side forms, Fig. 3, the mitered ends are cut at a greater degree so that the hinged side will close. To cast the parts, place the frames on a level surface, Fig. 2, then fill with cement and strike off level. Set the precast sides and ends on a freshly poured concrete bottom, Fig. 1, and form water channels in the bottom with a length of pipe. Screw two ½-in. pipe nipples into an elbow and place one of these units in each channel. Water is poured into these through a funnel.



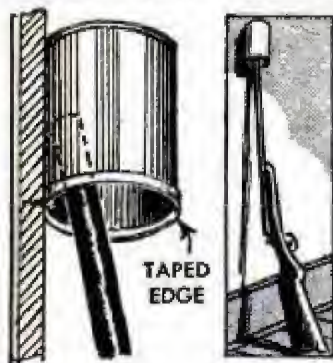
Counter Rack Keeps Trays Handy



If serving trays are used often, this simple rack fastened to the end of a kitchen counter, will save many steps. The rack consists of a bottom board, two side pieces and two front members which are nailed together as shown and then attached to the cabinet from the inside with screws.

Elizabeth Clarke, Syracuse, N. Y.

Rifle Support and Muzzle Cap Made From Tin Can



By nailing an inverted can to the wall of his cabin, one man made a useful combination gun support and muzzle cap for his hunting rifle. The can was fastened at a height that permitted the barrel of the gun

to be slipped into it with the butt resting on the floor. In addition to protecting the muzzle against falling dirt and possible damage, the can also allows circulation of fresh air, thus preventing rust caused by accumulation of moisture inside the barrel. Cover the sharp edge of the can with adhesive tape to avoid cutting the hands.

Removing Cork Pushed into Bottle

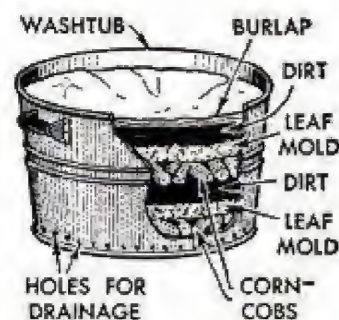
A cork which has been pushed into a bottle can be removed by filling the bottle with enough ammonia to float the cork.

After a period of about 48 hours, the ammonia will have caused the cork to crumble and it then can be poured from the bottle.

Gerald Iannuzzi, Jr., Yonkers, N. Y.

Raise Your Own Fishing Worms For Year-Round Use

You can have fresh, healthy fishing worms in the driest weather when they are hard to find, for ice fishing all winter long, and for fishing in the early spring, if you raise them in the following way.



An old washtub, which makes an excellent, easily moved container for the worms, is prepared by punching a row of holes around the lower part of its side and a number of holes in the bottom to allow for drainage. Then, because the worms breed and multiply, cover the bottom of the tub on the inside with a piece of screen wire to prevent small worms from falling through the drain holes. Place a layer of corn-cobs, broken into short lengths, over the screen wire, next a layer of well-rotted leaf mold, and then a layer of rich soil. Repeat this procedure until the tub is nearly full, and lay several burlap sacks across the top. After dampening the contents of the tub, dig a few hundred worms and place them under the sacks. Feed the worms every ten days with a mixture of coffee grounds, 1 cup, thick, sour milk, 1 cup, and syrup, 3 tablespoonfuls. Merely pour this mixture under the burlap covering. The tub should be kept in a cool part of the basement during the summer months, and in a warm place, preferably near the furnace, during the winter. Keep the contents of the tub damp but not too moist, for the best results.

R. A. Jenkins, Los Angeles, Calif.

Dust-Free Picture Framing

Removing a picture from its frame to dust behind the glass will be unnecessary if the picture is sealed between the glass face and the backing. Place the three parts on a flat surface, weight them with a heavy object, and coat the edges of all three with nail polish.



Benj. Nielsen, Aurora, Neb.

These Locks Foil Prying Fingers of Tiny Tots

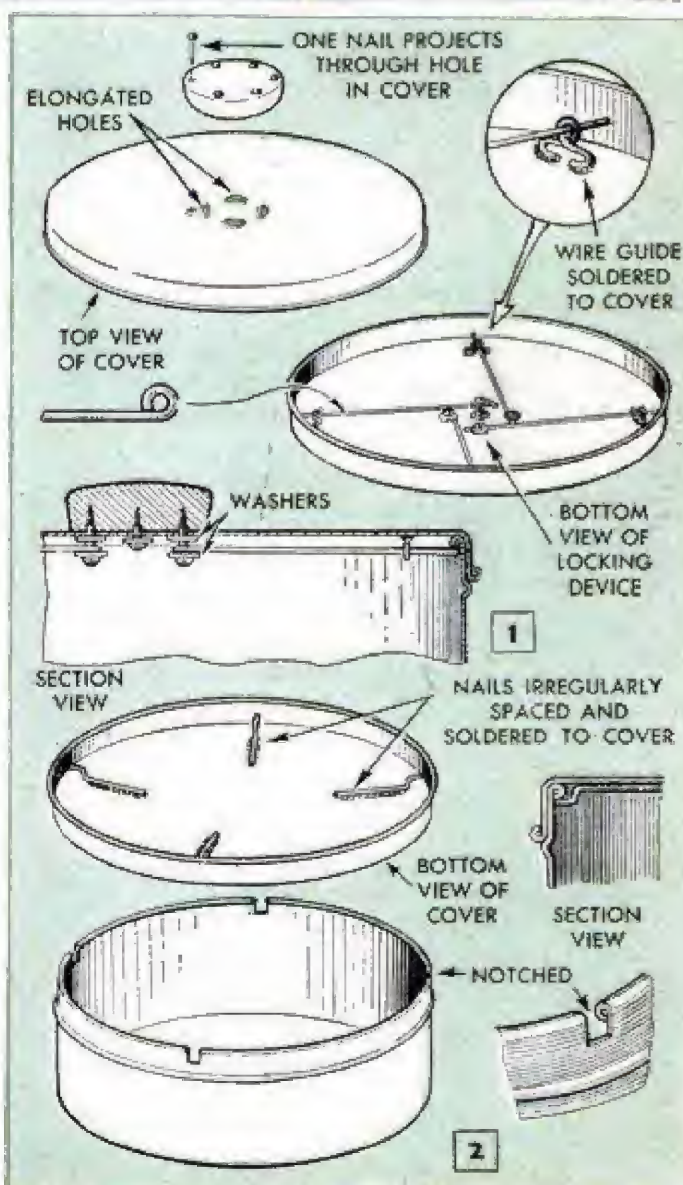
Secret locks for metal containers, drawers and closet doors baffle young explorers

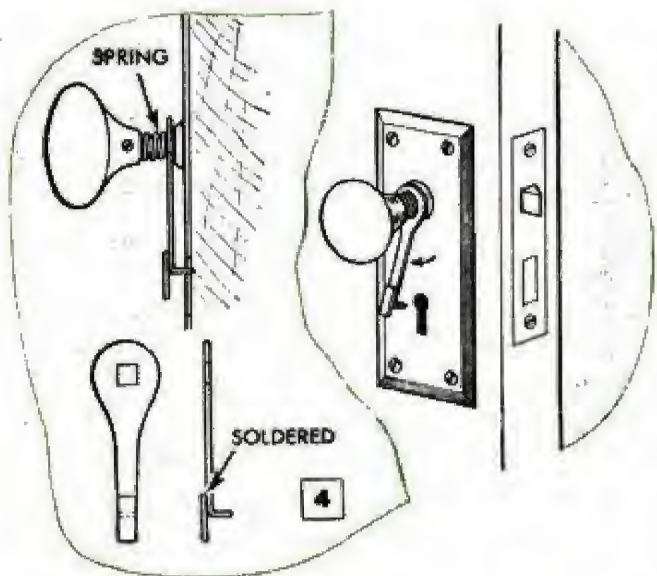
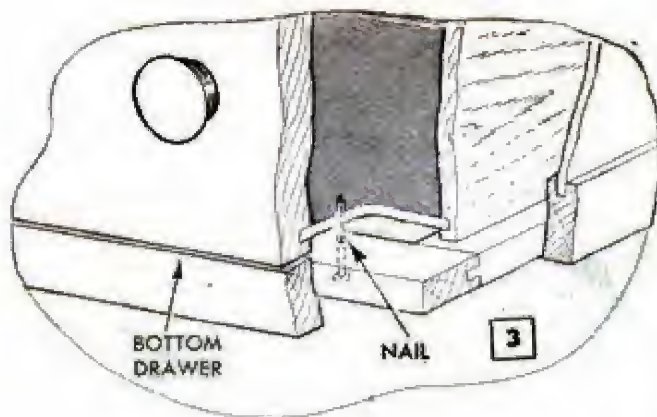
By John D. Adams

IF THE small fry in your home are at an inquisitive age, you can foil their attempts to explore every drawer and nook in the house by installing these simple locking devices. Figs. 1 and 2 show two types of locks suitable for round containers having a friction lid, such as a metal candy box. In the first type, Fig. 1, there is no indication of a lock except the round ornamental knob at the center of the lid. To all outward appearances this is held in place with six escutcheon pins with polished heads, but one of these, fitted in a slightly oversize hole, is the "key" to the lock. This pin extends through a hole in the cover and when it is partially withdrawn, the knob can be turned to release the four locking bolts which engage the rim of the container when the device is in the locked position. The four locking bolts are identical in size, each having an eye bent in one end. Outer ends of the bolts are held in place by wire guides soldered to the underside of the lid. Wood screws passing through the eyes of the bolts and through elongated slots cut in the lid are turned into the underside of the wooden knob as shown in the sectional view, Fig. 1.

Another lock for the same type of container is shown in Fig. 2. This one has no exposed parts. Four finishing nails are bent with a slight offset and then soldered to the underside of the lid in irregularly spaced positions to form locking lugs. Four narrow notches are cut in the rim of the container, the spacing of the notches being exactly the same as that of the lugs on the lid. To close the container, the lid is placed so that the offset ends of the lugs drop into the notches. Then the lid is given a quarter turn to lock it. To release the lid, it must be turned back to the same position each time, as otherwise the irregular spacing of the notches and locking lugs prevents it from being opened.

The bottom drawer of a dresser or chest of drawers may be locked by the





method shown in Fig. 3. With the drawer in the closed position, drill a hole through the rail and through the drawer bottom. The hole should be of a size to take a small nail snugly so that it will not drop out of the rail when the dresser drawer is pulled out. The nail should project through the drawer bottom about $\frac{1}{2}$ in. when the drawer is in the locked position.

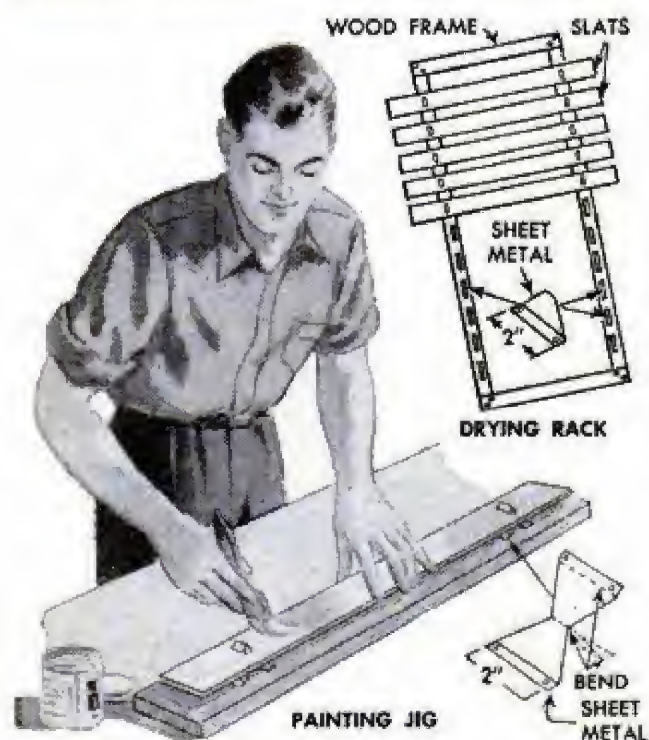
If the lock on the closet door is fitted with the locking lug shown in Fig. 4, it will be impossible to open the door even though the locking bolt has been released with a key. Remove the inside knob, and then drill and shape a piece of heavy sheet metal as shown. File the hole to a snug fit over the square lock shaft and bend the lower end of the piece at right angles to form a lug which will fit into the upper part of the keyhole. Solder or rivet a second piece to the bent end in the position shown. This should project far enough beyond the bend to cover the keyhole completely. Then re-assemble, with a short coil spring between the knob and the locking lug. To open the door it will be necessary to insert a nail or length of wire through the keyhole and press the locking lug outward until it clears the keyhole. Then the knob can be turned to withdraw the striker. This will effectively keep the youngsters from entering closets which are used only for storage.

Painting Venetian-Blind Slats Is Simplified by Jig and Drying Rack

Recalling past experiences in painting the Venetian blinds in my home, I tried to find a way to do a faster and neater job. The results of my efforts are this painting jig and drying rack which have been extremely useful. I used scrap lumber for

the wooden parts of the fixtures and cut small sheet-metal brackets from tin cans. The best way to paint the slats on the jig is first to do one end and then the other while holding the center portion so the slat does not tilt. Then paint the center part of the slat. The slats are turned over and later moved to the drying rack by placing the fingers on the end grain, as this part can be touched up in a jiffy while the slat is on the drier. The drying rack is arranged to space the slats about $\frac{1}{2}$ in. apart, and as I had a number of blinds to refinish, I made several racks to speed up the work.

Fred Roner, Flushing, N. Y.

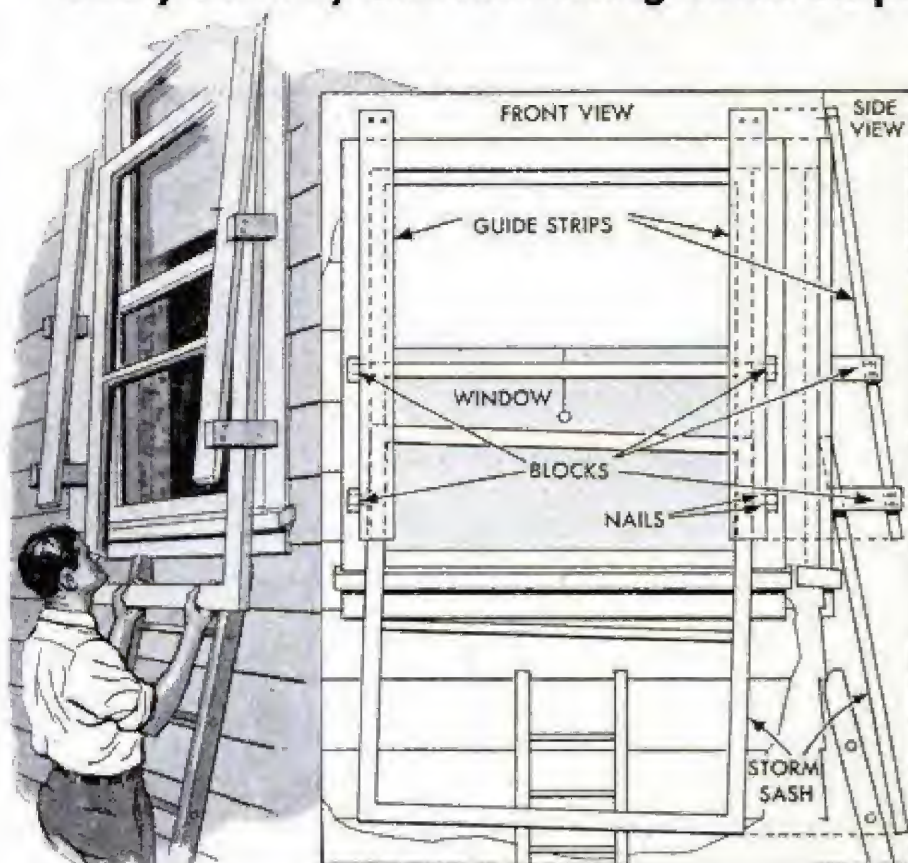


Moisture-Resistant Brick Walls

Moisture penetration through walls above grade is one of the most serious problems of brick construction. To withstand this penetration, brick-masonry walls should have their tops covered and be constructed with high-lime-content mortars finished with concave mortar joints. Bricks with moderately low water-absorption properties should be used, while the mortar should have the property of retaining moisture. The type of wall does not influence moisture resistance.

Because there was no help available, E. C. Ziesel of La Grange, Ill., had to put up the heavy second-floor storm windows on his home by himself. After some thought, he succeeded in overcoming the awkward and dangerous aspects of the job by devising a pair of guide strips that permitted sliding the window in place from a ladder without the usual delicate balancing. The guide consists of two 1 by 4-in. boards tacked at the top of the window so that each of the boards partially overlaps one side of the casing. The lower ends of the strips are blocked out from the side of the house about one foot to allow for the pitch of the ladder. As the window is lifted, it can be supported by the ladder until engaged by the wooden strips. Then, the strips guide the window into place as it is pushed up from the ladder. After the win-

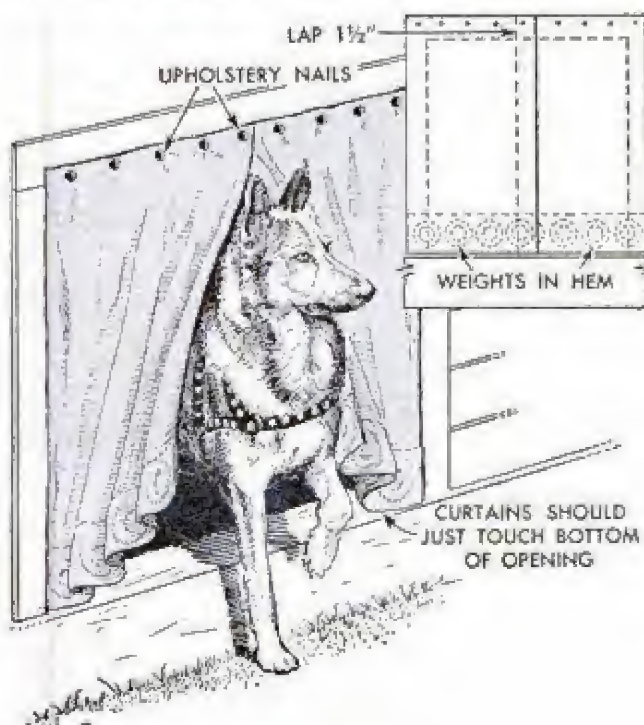
Installation of Second-Floor Storm Windows Easily Done by One Man Using Guide Strips



dow is fastened, the guide, being loosely nailed, is readily removed for use on other windows of a similar size.

Weighted-Curtain Doorway for Pet Permits Unhindered Passage

If your dog or cat sleeps under a porch, or in a barn or garage, here is a door made of heavy, weighted curtains that allows him to enter and leave his quarters without



difficulty. The curtains keep out drafts and insects and, unlike hinged wooden panels, they will not swing back and strike the animal as he passes through. The curtains are cut in two panels so they lap about 1½ in. at the center and about the same distance over the frame at each side. The bottoms of the panels are hemmed and weighted with washers, and their tops are fastened to the doorway with upholsterers' nails. When in place, the curtains should just touch the bottom of the opening.

Hi Sibley, Nuevo, Calif.

Keeping Clock in Good Condition

One jeweler keeps his clocks lubricated by placing a small kerosene-soaked cloth inside each clock. The cloth is wrung partially dry before inserting it in the clock, and a few drops of kerosene are applied to the cloth from time to time. Kerosene fumes keep the mechanism lubricated.

Anthony Edwards, South Bend, Ind.

❏ Worn sheepskin-lined slippers, when cleaned and turned inside out, make excellent shoe-polishing mitts.

BEFORE YOU BUY A MODEL

It's a logical precautionary measure to learn to recognize fine workmanship and materials even though the manufacturer's reputation indicates merit of a model gasoline engine

By Robert Lloyd Brown

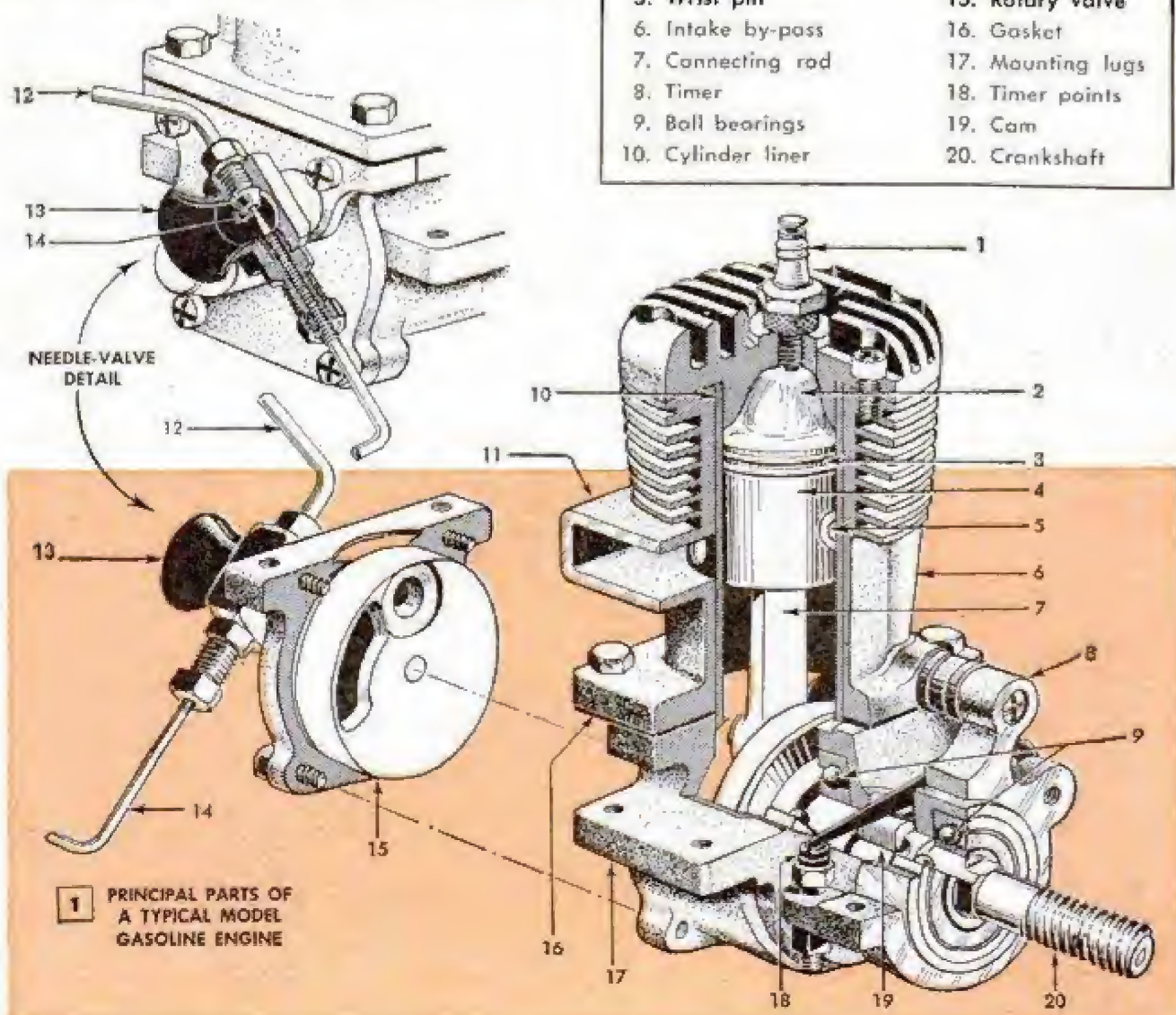
IN SELECTING a miniature gasoline engine for a model airplane, racing car or boat, the reputation of a particular engine usually can be depended upon. Nevertheless, if you want to make sure you get the engine suited to your purpose, keep in mind several important points which considerably affect the performance of this type of engine. The principal parts of a typical model gasoline engine are identified and located in Fig. 1.

Cast-iron cylinder blocks, either with or without steel liners, or steel cylinders are preferable in certain applications to aluminum-alloy blocks with steel liners. The cast-iron cylinder takes a better internal wall finish, affording a higher compression

ratio, and it runs cooler than steel. However, the steel cylinder has superior strength for a given wall thickness. Steel pistons are preferable to the cast-iron or aluminum-alloy types because they have greater strength, better finish, uniform shape and lighter weight. The wrist pins may be either of bronze or steel, but brass pads should be inserted in the ends of the wrist pins to prevent scoring of cylinder walls.

KEY TO PARTS OF MODEL ENGINE

- | | |
|----------------------|-------------------|
| 1. Offset spark plug | 11. Exhaust stack |
| 2. Piston baffle | 12. Fuel line |
| 3. Piston rings | 13. Intake tube |
| 4. Piston | 14. Needle valve |
| 5. Wrist pin | 15. Rotary valve |
| 6. Intake by-pass | 16. Gasket |
| 7. Connecting rod | 17. Mounting lugs |
| 8. Timer | 18. Timer points |
| 9. Ball bearings | 19. Cam |
| 10. Cylinder liner | 20. Crankshaft |



ENGINE

One of the quickest ways to appraise an engine is to study the crankshaft. If it is carefully machined from high-grade material, it is an excellent shaft, provided the cross-sectional sizes are sufficiently large to prevent distortion or whipping at high speeds. Manufacturers of two-cycle engines designed for installation in model speed planes, where space and weight are extremely limited, quite generally use the composite counterweighted crankshaft shown in Fig.

1. Properly machined and balanced, this type of shaft will attain extremely high speeds without distortion or damaging vibration. Ball bearings are used on parts that are designed to operate at high speeds, but for crankshafts, which rotate at comparatively slow speeds, oil-impregnated bushings are adequate. Take a good look at the crankshaft bearing. The longer it is the better. However, if the bearing is made of bronze and is not the self-oiling type, which requires no supplementary lubrication, it should have lubrication grooves to prevent seizing.

Note the needle valve and valve body of the carburetor. They should be made of



the same material so that their coefficients of linear expansion will be identical. Brass often is used for these parts as aluminum is too soft for this purpose. The needle valve should have a very fine thread to obtain minute adjustments of the mixture. Gas-resistant, transparent-plastic fuel lines are an advantage due to the fact that a clogged fuel line can be detected immediately, as the flow stoppage is apparent.

Ordinary paper, cardboard or cloth does not provide satisfactory engine gaskets. They should be cut from special gasket material that is both heat resistant and strong, and sealed in place with pure orange shellac, for best engine performance.

Darts Whittled From Wooden Shingles Are Thrown Long Distances

These high-flying darts can be made by any child old enough to use a knife for whittling, and after a little practice, they are easily thrown a surprisingly long way. The darts are shaped from a wooden shingle, as indicated. The thin end becomes the tail, this portion of the shingle being about 2 in. wide. Then a notch is cut about 1 in. from the butt end of the shingle. A piece of string approximately 2 ft. long is tied to a handle and a large knot is made at the end of the string. Fishline or strong twine is best for this purpose, while any stick or tree branch that will not break readily provides a suitable handle. To launch the dart, place the string in the notch and pull tight against the knot. Hold the tail of the dart in one hand, the handle in the other, and keeping the string taut, release the dart as the handle is whipped forward and upward.—M. K. Voedisch, Rockford, Ill.



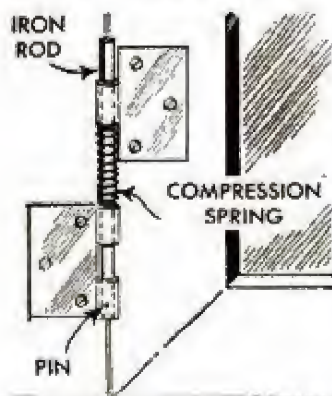
Length of Pipe Fitted With Tee Bends Rigid Conduit



When doing a wiring job that requires the installation of rigid, electrical conduit, the conduit can be bent easily with a tool made by fitting a pipe tee with a long piece of pipe for a handle. The tee, of course, must be large enough to permit the conduit to pass through it. With this tool, the conduit can be bent as shown in the drawing. If a bend with a large radius is desired, bend the conduit slightly and slide the tee a few inches before applying pressure again. Repeat this procedure until the proper bend is obtained.

Victor H. Lamoy, Upper Jay, N. Y.

Spring Hinge on Casement Window Facilitates Opening



Should the casement windows in your home be of the type that must be raised slightly before they can be opened, here is a method of surface hinging that permits the windows to lift automatically when unlatched. The leaf

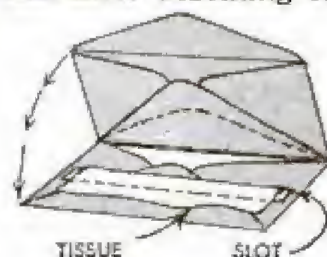
of the hinge that is screwed to the window sash is placed a distance above the hinge leaf fastened to the casing. Then, a short length of iron rod is inserted through the barrel of the lower leaf and is held in place with a pin. After a compression spring is slipped over the projecting end of the rod,

the barrel of the sash leaf is set over the rod so that it rests on the spring. If the hinges on the window are altered in this manner, much of the weight of the sash will be supported by the springs, making the window easy to lift when opening. Another advantage is that this method of hinging permits the whole sash to be lifted instead of the unhinged edge only, as is the case when the window is hinged in the usual way. The size of compression spring used should be determined by the weight of the window and the type of hinges.

Adolph Sprenzel, Chicago.

Envelopes Form Pocket Dispenser For Cleansing Tissues

Cleansing tissues may be kept sanitary while being conveniently carried in a pocket or purse if they are held by a dispenser made from two large envelopes. A $\frac{1}{2}$ -in.-wide slot is cut in the side of the envelope into which the tissues are inserted. The tissues should be removed from their box without disturbing the interlocking folds, so they will feed from the envelope in the same manner as they do from the box. This can be done by cutting out the bottom of the box and later resealing it with tape. The envelopes are fastened together so that the second one serves as a cover for the slot. — Andrew Vena, Philadelphia, Pa.



Reproducing Pitted Wrought Iron

If rusted, deeply-pitted iron cannot be found for hand-wrought craftwork, much the same effect can be attained by etching the pieces of iron available. The etching solution consists of commercial nitric acid, 1 part, and commercial muriatic acid, full strength, 1 part. Mix the solution by placing the nitric acid in a glass jar, and carefully pouring the muriatic acid into this. Then, lay the iron on the ground and apply the solution liberally to its surface, using a cotton swab as an applicator. When the fuming stops, add more of the solution. Wash off with water, and repeat the process until the desired depth of etching is obtained. If the etching is done on finished pieces, heat them to a cherry red after etching to stop the action of the acid. *Caution:* Do not allow the acids to come in contact with the hands or clothing, avoid inhaling the fumes and do all the work outdoors away from children and pets.

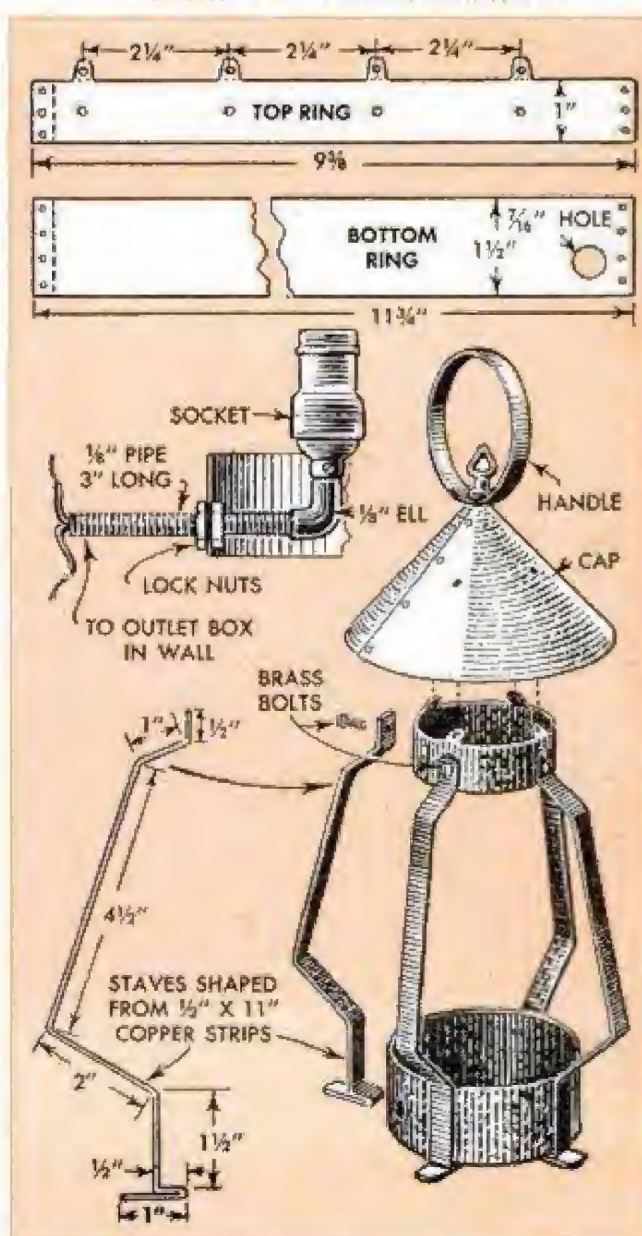
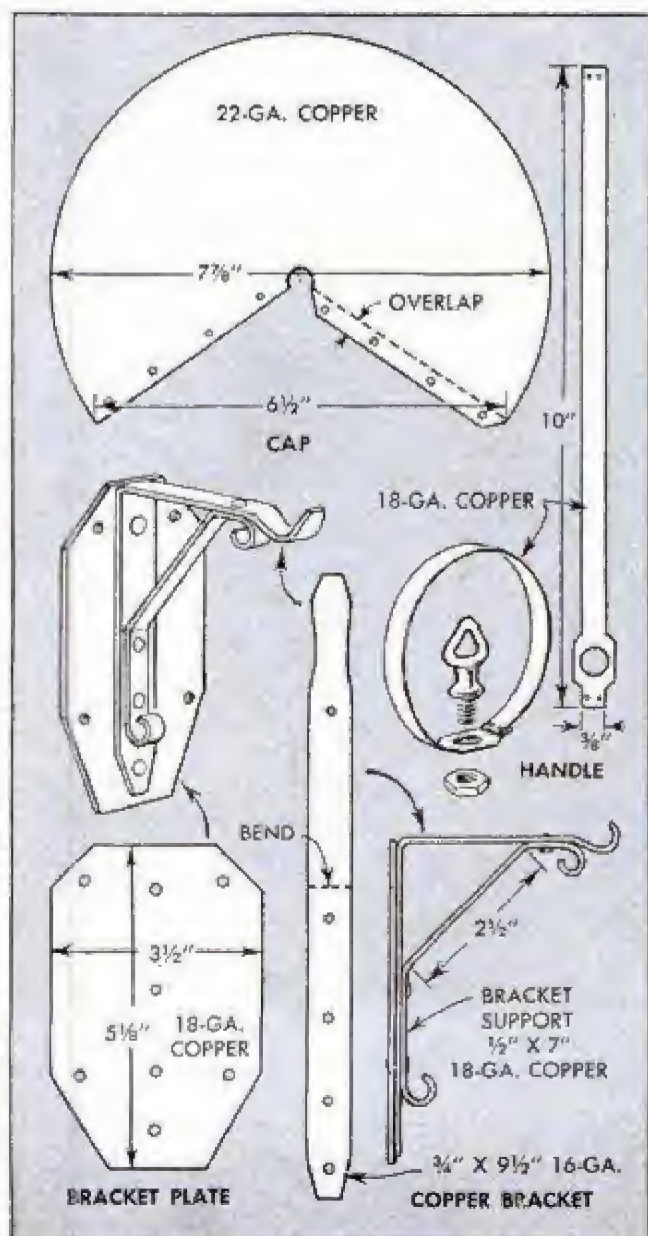
Dick Hutchinson, Alhambra, Calif.

PORCH LANTERN

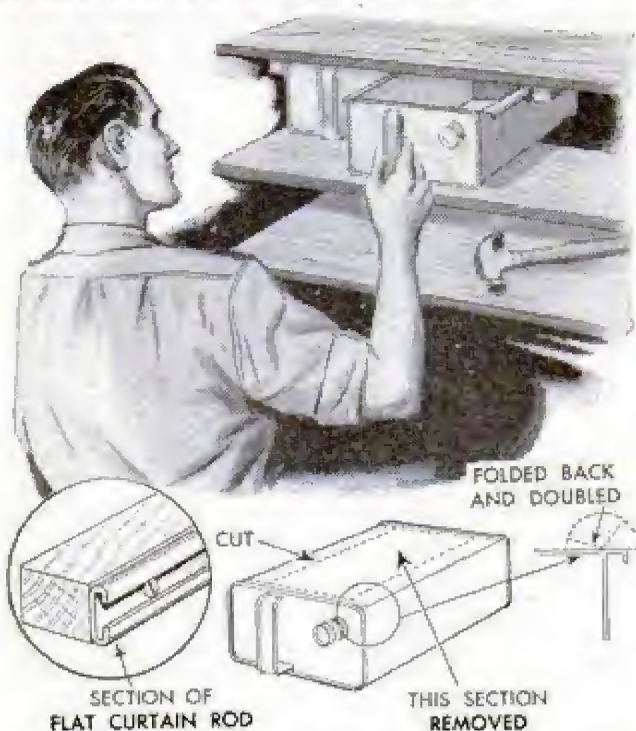
in hammered copper

HERE'S a quaint and charming porch lantern that will add a distinctive touch to a colonial entrance. The top and bottom bands are formed to fit the ends of a globe taken from a kerosene lantern. The four staves, which attach to the top band with small machine screws, are bent to spring out at the bottom and permit removal of the globe and bulb. Other parts of the lantern are riveted together where indicated with No. 14 brass escutcheon nails. After a trial fit, all parts are antiqued. To do this, clean with fine steel wool and paint with copper-nitrate solution. Next, apply the flame of a blowtorch and heat the copper until it first turns green and then brown. When cool, burnish the metal with emery paper and then wax.

Dick Hutchinson, Alhambra, Calif.

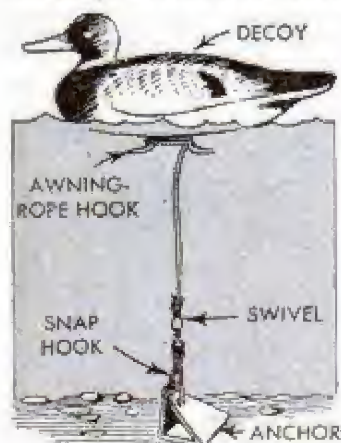


Shop Drawers of Gallon Cans Slide on Curtain-Rod Runners



If you wish to install drawers in your workshop but don't care to stand the expense of wooden ones, 1-gal. cans of the type in which motor oil is sold will provide excellent drawers. As the cans are already equipped with a handle, just cut out one side and fold back the edges, as shown in the detail. Runners for the drawers are provided by sections of flat curtain rod in which the edges of the can are bent to slide. These sections are screwed to wooden cleats, which are fastened to the underside of a shelf or table top.

Decoy Anchor Line Is Nontangling



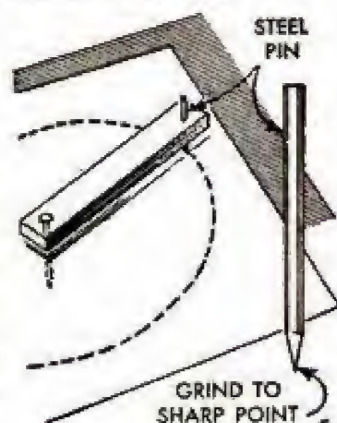
Every wild-fowler who has coiled icy anchor lines around slippery wooden decoys will welcome using an arrangement of the lines which simplifies the disagreeable job of picking up decoy sets. To make this arrangement, screw an awning-rope hook

to the bottom of each decoy, being careful to center it. If off-center, it will cause the decoy to ride unevenly. Wind the anchor line on the awning hook and then attach a snap hook to the swivel at the free end of the line. When you set out the decoy, just snap the hook over the anchor ring. In

taking up the set, release the anchor and wind the line on the hook. There's no tangling and breaking of the lines.

Cutting Holes in Sheet Metal

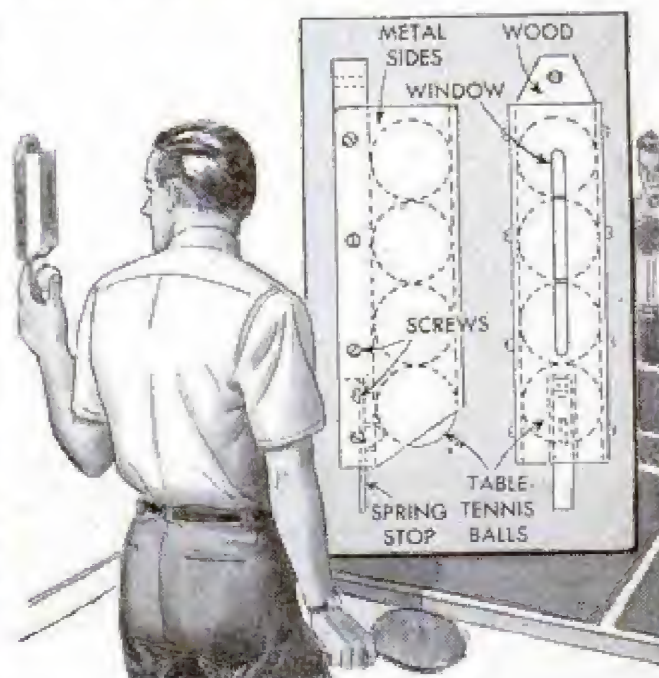
When it's necessary to cut a neat, round hole in the bonnet of your furnace for a run of pipe, or for that matter, a large hole in any light sheet metal, here's an easy way to do it. Just take a piece of board slightly longer than the radius of the hole



and drive a nail through the board near one end to serve as a pivot. Next, drive a hardened steel pin through the board the exact distance from the nail as the radius of the hole. Then, drive the nail through the sheet metal at the center of the hole and press down on the pin end of the board while rotating it around the pivot. The steel pin will cut through the metal in a short time, leaving a perfectly round hole.

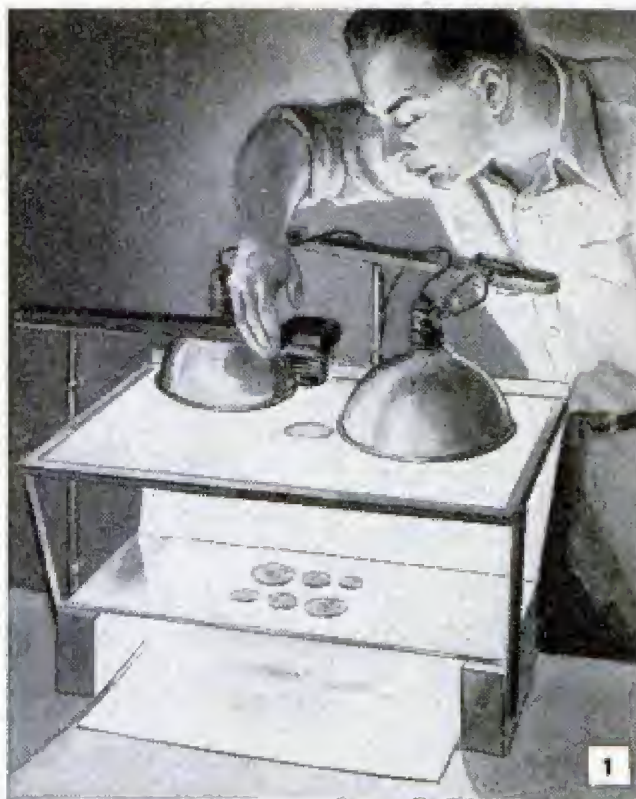
Table-Tennis Ball Dispenser

Attached to a wall or post in a convenient location in the recreation room, this novel dispenser keeps table-tennis balls handy. Sides and front of the unit are bent from sheet metal and screwed to a wooden back. A slot is cut in the front to indicate the number of balls in the container. A spring stop releases the balls. The length of the dispenser, of course, determines the number of balls it will hold.



Photographing OLD COINS

FLAT LIGHTING is the answer to the problem of photographing coin collections in sharp relief, and here is a table-top setup for filtering the light to give just the right diffusion. It's accomplished by directing a couple of photofloods through tracing paper stretched over a framework as shown in Fig. 1. Shooting is done through a hole in the center of the paper, using fast film and the relatively short exposure of $\frac{1}{8}$ sec. at f:22. The coins are placed on a shelf of clear glass and are back-lighted from below with a third lamp as shown in Fig. 2. Note that a cardboard baffle is used to direct the light on the background only and that the light should be strong enough to kill any shadows produced by the two basic lamps. In shooting bronze coins, the background should be white, whereas gold or silver should be photographed against black. Fig. 3 shows a setup for photographing jewelry.



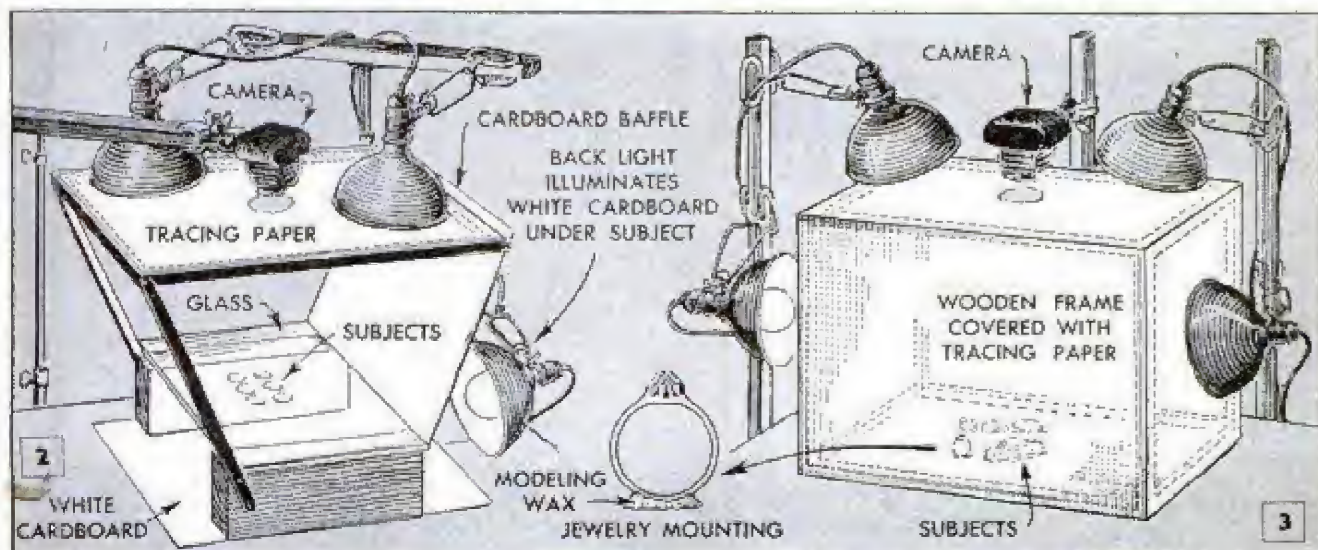
By directing two photofloods through white tracing paper a diffused light is obtained to eliminate glare and shadows. Third lamp lights background for coins



Bronze coins stand out sharply if shot against white or light-colored background. Back light must be strong enough to kill shadows cast on background by coins



Silver and gold coins photograph best if the background is black. Use a cardboard having a dull surface to prevent any reflection cast by the back light



Stage Your **PUBLICITY SHOT**



Healthful beach recreation is the basic idea here. Background and foreground set the locale, and the lively action and expressions clinch the idea

By
RICHARD W. EMERY

COMPETITION in the sale of publicity shots is keen and it takes more than just luck to sell an editor. The successful free-lance photographer knows that a good publicity shot must be built around a basic idea that will attract a great amount of attention. If not, his work will never see print. The basic idea may be to entertain, instruct or arouse curiosity, or its purpose may be to kindle a desire to possess something, to go somewhere or to do some particular thing.

There are many reasons for planning setup shots. Advanced planning enables you to create a picture in which the basic idea is presented forcefully and in such a manner that the picture completely tells a story or strongly conveys one thought.

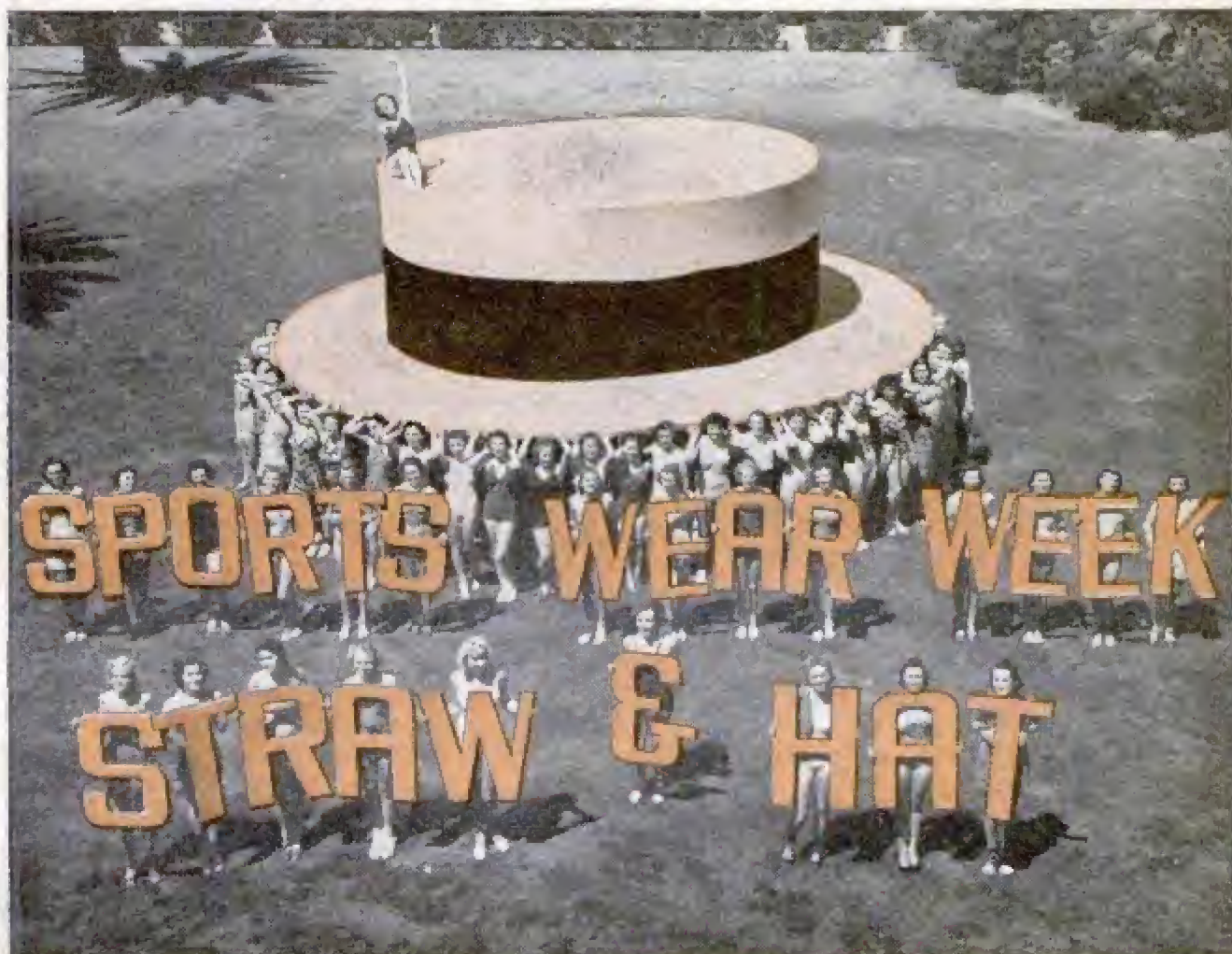
In my work, I like to plan a picture first by making rough pencil sketches of the idea and then work out the details involved in shooting it. I study the location for best camera angles and the subject for best lighting. Most of all, I try to visualize the finished picture. Frequently, in planning a picture on paper, I try to add some

Photos by Ray Chapin

↓ Publicity photo illustrates use of props to tell a story. Note also how high camera angle deepens foreground and focuses attention on basic idea. Stunt was used to promote interest in straw-hat sale



↑ Shot of a helmeted pipe fitter holding a ribbon-tied diploma of pipe is saved by the words, "Pipe Fitting School," over door. Without sign and doorway, photo would lack basic idea and tell no story





† An outdoor concert of forty pianos produced a curiosity-whetting picture to publicize National Music Week. Here, the pianos express the basic idea or theme



detail or object to the foreground to give purpose and meaning to the composition.

In the typical photo of a person or a group of persons, there are eight factors to consider carefully in following through a basic idea. These are: (1) model or models, (2) clothes or costumes, (3) pose or action, (4) lighting, (5) center of interest or composition, (6) background, (7) props, (8) foreground. In some cases, one or more of the factors may be given less emphasis in order to focus attention strongly on other points of interest. The accompanying publicity shots show how the eight factors are put to work.

In some photos, all eight factors are combined to build up and convey the basic idea.

This shot tells its story through careful use of all eight factors. The three sailboats, photographed in pleasing order, provide picture with a basic theme



← Staged to publicize fishing tournament, this picture blends model, costume and props to tell story. Photo of trophy alone would lack purpose. Note narrow composition which lends photo to cropping for one-column use

Photo of bathing girl on → a cluster of balloons publicizes beach carnival. The basic idea is expressed by the props and the costume of model. Low camera angle exaggerates size of the balloons, adds sky background



↓ Picture of drum majorettes being instructed in marching makes use of foreground action to tell its story. Basic idea is that majorettes have fun while learning to march. Purpose was to attract new members to majorette corps



Nonslip Edge on Trimmer Bed Aids Cropping Buckled Prints.



Trimming buckled photoprints is difficult because the paper will creep on the board, resulting in an uneven edge. One way to overcome this is to cover the cutting edge of the board with a strip of masking tape. This produces a nonslip surface that will hold the print firmly in place. When not needed, the tape can be removed as it may tend to slow the trimming operation for prints that are perfectly flat.

Dial Thermometer Clipped in Place



Dial-type photo thermometers are handled more easily if a spring clothespin is taped to the stem, as shown. Then it can be clipped to the side of a pan, tray or tank, or when not in use, to the edge of a shelf or bracket. Use adhesive tape to fasten the thermometer.

Sliding Mask for Double Exposures Produces Trick Shots

Trick double exposures, such as showing the same person twice on one frame, etc., can be made by mounting a square filter holder over the lens as indicated. After this has been done, the holder is fitted

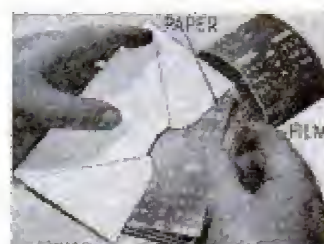


with a sliding mask of black cardboard. By moving the mask to one side of the holder and making an exposure and then shifting it to the opposite side for a second exposure, you will expose half the frame at a time,

resulting in two shots of the subject, side by side. It may be necessary to do a little experimenting in cutting the cardboard mask so that it covers just half the lens.

Backing Paper Used as Separators

Where photographic negatives are stored in paper envelopes, direct contact of the film may cause scratches, or moisture in the air may soften the glue on the envelope and spot the negative. If the backing paper that comes with roll film is cut into pieces and placed between the lengths of film, scratches or spots are not so apt to occur.



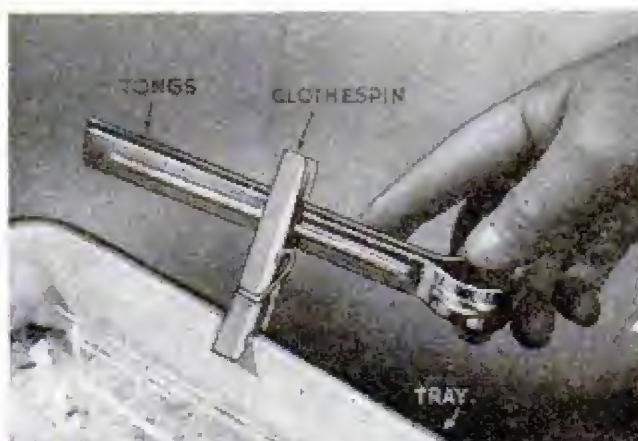
Reading Low Values of Photo Meter

When taking photographs in a dim light and the lower portion of an exposure meter scale is used, better readings can be obtained if a magnifying glass is placed over the scale glass. Adhesive tape is used to fasten the magnifier in place. When not in use, the glass and tape are easy to remove and do not harm the meter.



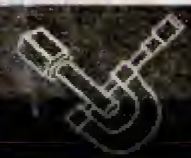
Clothespin Holds Print Tongs

While developing prints, tongs should always be within reach, but not placed where they will be contaminated by chemicals. A convenient place to keep the tongs is between the arms of a spring-type clothespin that has been clipped to the side of a developing tray. One clothespin will hold most tongs, but if not, use two pins and space them apart.





SHOP NOTES



Build Your Own ARC WELDER

Part I

By Evan Wright

BY REWINDING a discarded or burned-out service transformer and installing it in a housing mounted on a two-wheel cart, this portable a.c. arc welder, shown in the upper right-hand photo, was built entirely with hand tools for less than \$25. It will handle metallic-arc welding rods from the smallest up to $\frac{1}{8}$ in. in dia. and can be regulated for use with a double-carbon arc torch for brazing, silver and soft soldering, and localized heating when bending, forging or heat-treating metal parts. In addition to welding, the metallic arc can be used for cutting metal and piercing holes when bolted construction is desired.

Selection of a transformer for rewinding is made on the basis of the output desired and the service current available. Where the welder transformer output required is approximately 150 amperes of welding current, the transformer should weigh at least 75 pounds exclusive of its cast-iron container or "pot." A welder of this output will handle almost any job on the farm or in the small shop and can be operated on a 220-volt circuit drawing a maximum of 30 amperes. Most shop or farm electric

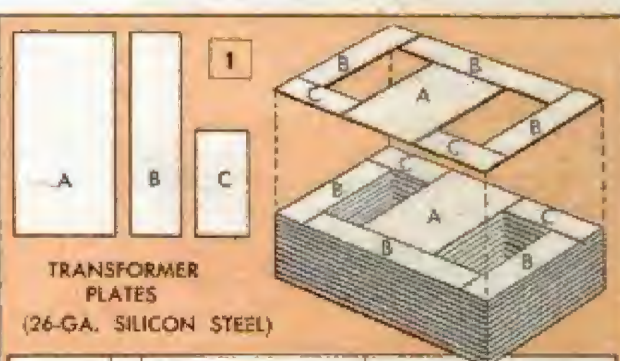
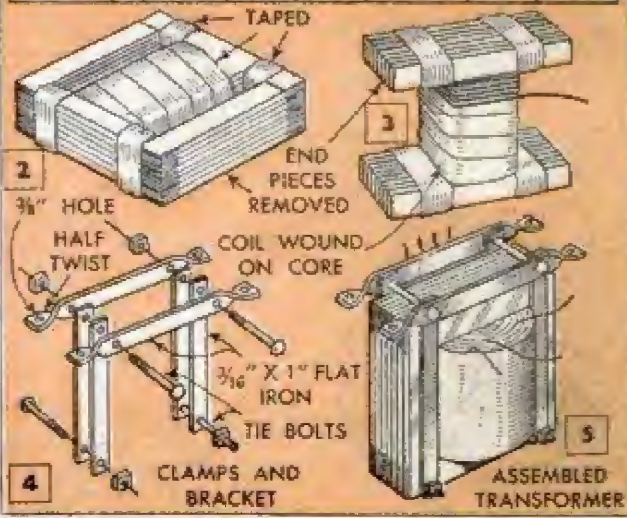
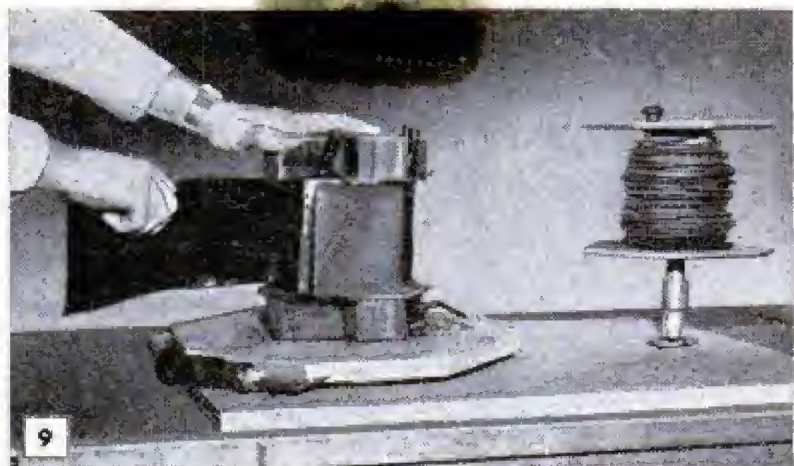


TABLE I	PLATE	100-Ampere Welder			200-Ampere Welder		
		Height of pile	Dimensions		Height of pile	Dimensions	
50 to 60 cycle current	A	3 1/2"	3 1/2"	7"	4"	4"	8"
	B	10 1/2"	1 1/2"	7"	12"	2"	8"
	C	7"	1 1/4"	3 1/2"	8"	2"	4"
25 to 40 cycle current	A	4"	4"	8"	4 1/2"	4 1/2"	9"
	B	12"	2"	8"	13 1/2"	2 1/4"	9"
	C	8"	2"	4"	9"	2 1/4"	4 1/2"



Reprinted in Shop Notes



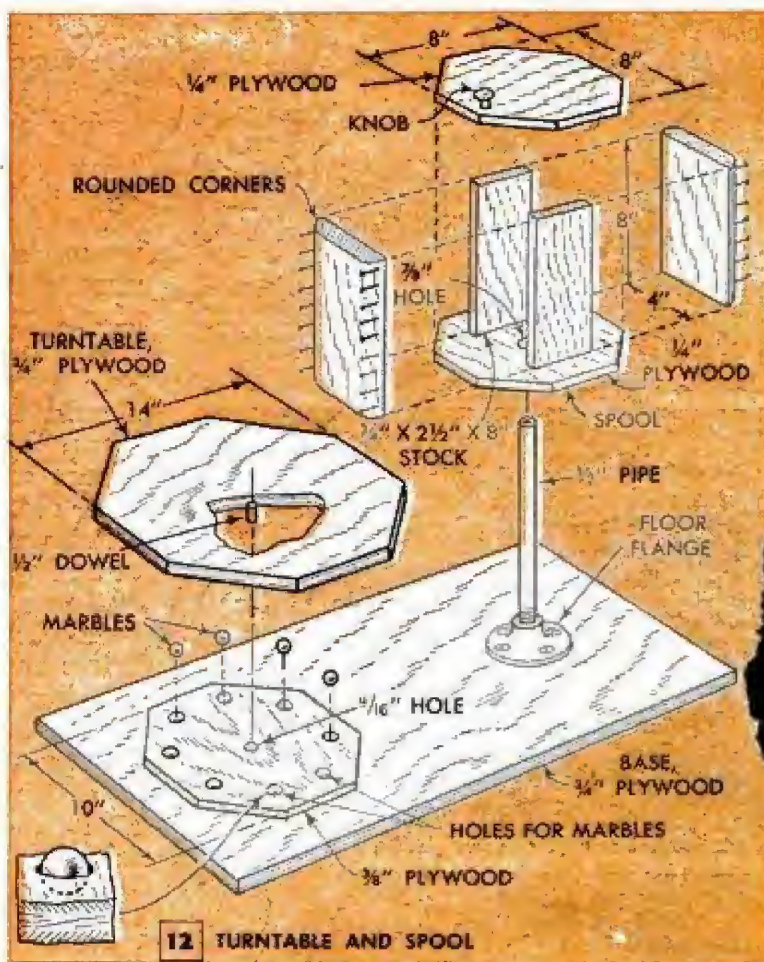
service will meet these requirements. However, check with your local electrician or power company as to the maximum load that may be imposed on the service line. Pole transformers, rated from 2 k.v.a. to 5 k.v.a., are recommended for making welders of approximately 150-ampere, 35 to 40-volt output. A smaller welder made from a rewound light industrial or X-ray transformer will deliver sufficient amperage for most welding jobs in the home shop and can be operated on 110 volts with less than 30 amperes. For light welders, the transformer alone should weigh at least 50 pounds. Pole transformers and X-ray transformers suitable for rewinding usually are of the shell type, and for compactness, a 3 or 4-part transformer is recommended. In buying a junked transformer, take only the transformer itself, as the pot which houses it is not needed. Usually, the transformer can be lifted from the pot by removing 4 or 6 bolts.

If a discarded service transformer cannot be found, you can build one from regular transformer iron of No. 26 to 29 gauge. Rectangular sections are cut to sizes indicated in Table I, Fig. 1, and these are stacked so that the pieces overlap one another in the manner shown. The core and the two sets of outer laminations are taped together tightly, Fig. 2, and then the end laminations are removed. The coils are wound directly on the core, Fig. 3, using

the same size wires and procedure given for rewinding a junked transformer as will be described later. The end laminations are then replaced and clamps and brackets, Fig. 4, bolted to the core to compress and hold it together. Fig. 5 shows the completed transformer.

Dismantling a service transformer is done by first removing the porcelain cap used to distribute the leads. The clamps which hold the core sections also are removed, Fig. 6. These clamps usually are bolted to a cast-iron bracket from which the transformer hangs inside the pot. Coils in a common service transformer designed to reduce 2300 power-line voltage to 220 or 110 volts, usually have half the secondary winding wound directly on the core in two or more layers. These layers are covered with a fireproof insulating material over which the primary wiring is wound. The primary is covered with another insulating blanket and the remainder of the secondary is wound over this.

To proceed with the dismantling of the transformer, remove the 4 sets of outer laminations. These are cemented to each other with an insulating varnish and it may be necessary to use a linoleum knife and pliers to separate them as shown in Fig. 7. On some transformers the laminations are L-shaped, with the short legs alternating from one end to the other. Stack the laminations in a pile in the order

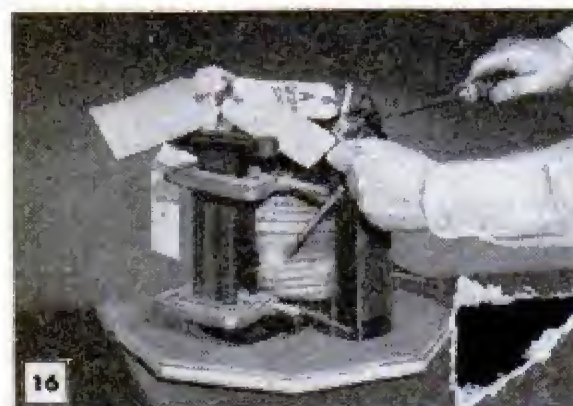
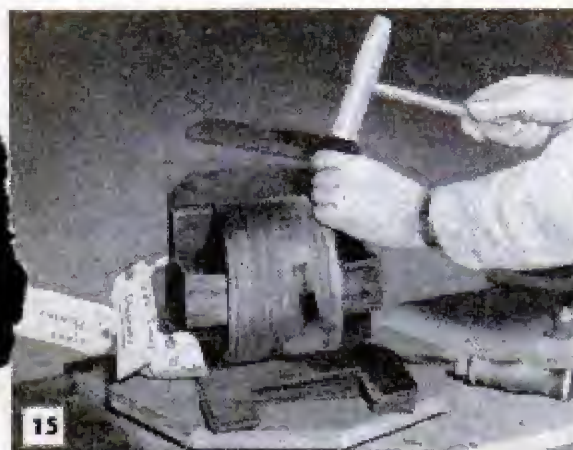
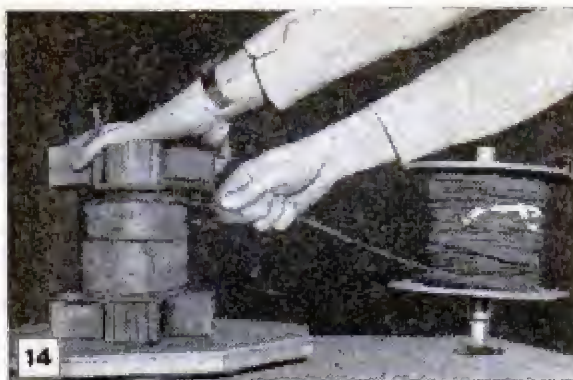


which they are removed and number them to correspond with the side of the transformer from which they are taken. Continue to remove the laminations from the other three sides, keeping each group stacked and numbered separately. After removal of the outer laminations, there remains the central core upon which the coils are wound. Using a turntable and spool, the construction of which is detailed in Fig. 12, remove the outer insulation from the first, or secondary, coil. Fasten the end of the wire to the spool and carefully unwind the coil as shown in Fig. 8. Being of smaller-gauge wire, the primary winding is wound on another spool in the same way. The inner coil, which will be of the same size wire as the first coil, should be wound on the first spool. Thick layers of glass or mica insulation separating the primary and secondary coils are removed, as shown in Fig. 9, and saved for reuse. The binding around the core should not be removed.

For arc welders delivering less than 100 amperes, the secondary coil should be wound with a wire size not less than No. 6 gauge and the primary with wire not less than No. 12 or 14 gauge. For the welder described, the secondary should be at least No. 3-gauge wire and the primary of No. 8 or 10 gauge. Original transformer wire can be reused if it is miked for size and then "paralleled" to make up the required gauge. Paralleling is done by combining a number of small-gauge wires and connecting them at the taps, thus providing a cross-sectional area equivalent to a larger-gauge wire. Table II, below Fig. 12, gives equivalent wire sizes to determine the number

TABLE II - WIRE EQUIVALENTS				
WIRE GAUGE SIZE	NUMBER OF STRANDS AND WIRE SIZE NEEDED FOR SUBSTITUTE			
3	2 of #6	4 of #9	8 of #12	16 of #15
4	1 of #9	4 of #12	8 of #15	16 of #18
6	1 of #11	4 of #14	8 of #17	16 of #20
10	2 of #13	4 of #16	8 of #19	16 of #22
12	2 of #15	4 of #18	8 of #21	16 of #24
14	2 of #17	4 of #20	8 of #23	16 of #26





of any specific small wires necessary to make one wire of a desired size. Wires smaller than No. 16 gauge may be paralleled into a single strand by twisting them together with a hand drill. Larger sizes may be paralleled by laying them side by side on the coil.

The first portion of the secondary should be wound around the core by pulling out a lead about 6 inches long, and labeling it with a shipping tag, "A-start secondary." Then lay in the wire, using a single strand or several wires side by side as in Fig. 10. In most cases you should apply the first 15 turns in one layer. Wrap this portion of the secondary with two layers of cotton cloth and shellac it, Fig. 11. The cloth should be completely saturated. Next, wind another 15 turns over the first layer and tag the end of this coil, "B-1 secondary, 30 turns." Now, replace one of the insulating blankets over the secondary turns as in Fig. 13. Wind one layer of the primary over this blanket, first taking off a lead and labeling it, "primary start." Fig. 14 shows 5 strands of the original primary wire twisted together. Wrap this layer with one thickness of cotton cloth and shellac. Continue with the primary winding, insulating each successive layer with cloth and shellac. Take off taps at 110 turns, 165 turns and the final tap at 220 turns. Label these taps, "1 primary, 110 turns," "2 primary, 165 turns" and "3 primary, 220 turns." After this, replace the other insulating blanket and begin the second section of the secondary coil. Label the starting end of this secondary lead, "B-1 start, 3rd layer secondary," and after 15 turns, tap and label, "C-2, 3rd layer secondary, 15 turns." Insulate this with two layers of cloth and apply shellac. Continue on the fourth layer of the secondary, tapping after 5 turns and labeling the tap, "3 secondary, 5 turns." Make 5 more turns and tap, labeling, "4 secondary, 10 turns," then make 5 more turns or a total of 15 turns, and label the final tap, "5 secondary, 15 turns." After this, replace the laminations, driving the pieces into place with a softwood mallet as in Fig. 15. Finally, replace the yokes and brackets, using C-clamps, as in Fig. 16, to hold the laminations in compression until the holding devices are in place.

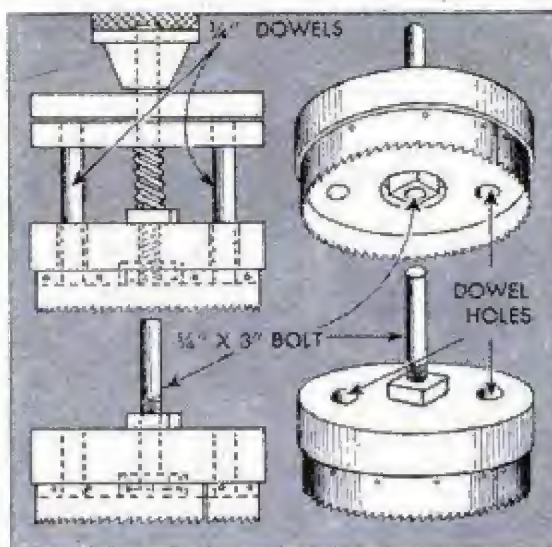
Long connecting wires are soldered to the leads, Fig. 17. Care must be taken to assure a permanent joint. Larger wires should be lapped and wrapped with fine wire before soldering. The secondary lead marked "B-1 secondary, 30 turns" may be connected with "B-1 start, 3rd layer secondary" and a common lead taken from them. The connecting leads should be about 2 feet long and fitted with lugs soldered in place. These leads may be insulated by wrapping and shellacking or by slipping sections of loom over them. If it is necessary to remove the identification tags when making the soldered joints, they should be immediately replaced to avoid any confusion later.

(To be continued)

Here is a hole-saw attachment for a drill press that speeds up the cutting operation by permitting the stock removed to be ejected from the tool while the drill press is running. Using an ordinary hacksaw blade, wood up to $\frac{1}{4}$ in. thick can be cut. A wider blade, of course, allows working with heavier stock. A 12-in. hacksaw blade will provide a saw with a maximum diameter of about $3\frac{1}{2}$ in. The tool is made by cutting a disk from $\frac{3}{4}$ -in. wood about $\frac{1}{4}$ in. larger in diameter than the desired size of the

saw. Then, the disk is drilled to take a $\frac{1}{4}$ by 3-in. bolt, countersinking the bottom of the disk for the nut. It also is drilled for two $\frac{1}{4}$ -in. dowels. The head of the bolt is cut off so it can be chucked in the drill press and it is fastened to the cutter as shown. A shoulder $\frac{3}{16}$ in. wide is turned on the underside of the disk to the exact diameter of the finished tool. This may be done by chucking the unit in the drill press and improvising a tool rest. To mount the hacksaw blade, heat it to a dull red and cut off one end square. Next, drill small holes near the top edge of the blade at intervals of about 1 in. Heat the blade again, if necessary, and bend it to the desired radius. However, be sure to bend the blade so that the teeth will be in proper cutting position after it is mounted. Finally, nail the blade

Homemade Hole Saw Increases Production By Removing Disk While Machine Is Running



to the cutter disk, starting with the squared end, and trim the other end to fit snugly against it. The ejecting mechanism consists of two disks of $\frac{1}{4}$ -in. plywood drilled to slide over the bolt. The lower disk is fitted with $\frac{1}{4}$ -in. dowels aligned with the holes in the cutter disk. A spring and then the lower disk are placed over the bolt, and dowels are inserted in the holes. The upper surface of this disk is waxed to permit the top disk to be grasped during operation without interfering with the rotation of the cutter. The drill-press chuck serves as a stop for the spring. In operation, the top disk is pushed down after the stock is cut. This forces the dowels through the holes in the cutter disk, ejecting the material in the center of the saw.

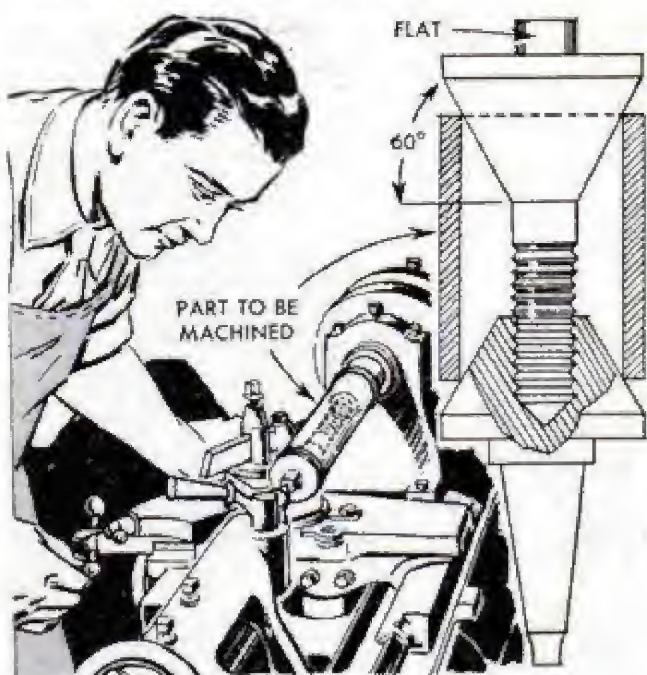
Ralph S. Wilkes, Elbridge, N. Y.

Push-Button Switch Operates Starter When Adjusting Valve Tappets



When adjusting valve tappets on new-model cars that are not provided with a crank and have solenoid-type starter switches, difficulty of turning over the motor can be overcome by using a portable switch of the type shown. This consists of a doorbell push button connected to two lengths of insulated wire which terminate in small battery clamps. Each of these wires should be several feet long so that when clamped to the solenoid and to the ground, the push button can be placed within easy reach. In this way, the mechanic can turn over the motor to bring the valve push rods into proper position by pressing on the push button. On cars not having solenoid starter switches, a regular starter switch or a heavy-duty switch should be substituted for the push button to carry the heavy current necessary.

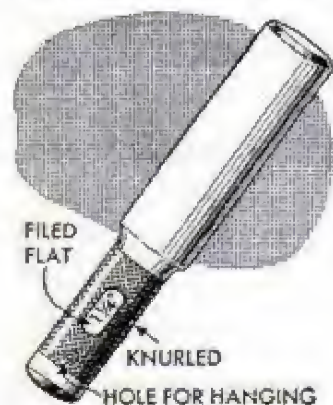
Cone Mandrel Chucks Work Between Lathe Centers



Sleeves and bushings can be machined to a certain diameter along their entire length when chucked in this cone mandrel. It fits into the hollow spindle of the lathe and is supported by the tailstock center. The detail shows how two cones center the work automatically by one cone threading into the other. Note that a flat is filed on the end of the tailstock cone to permit tightening it with a wrench.

Nathan Bogoch, Winnipeg, Man., Can.

Plug Gauges of Cold-Rolled Steel



A set of plug gauges made from stock sizes of cold-rolled-steel rod will prove very useful for gauging holes and setting outside calipers where the tolerances are not critical. Although cold-rolled steel is generally undersized, it is advis-

able to mike the pieces to make sure they are not oversized and not too much undersized. Turn and knurl a handle on each gauge and then file a flat on the knurled portion to provide a space for stamping the size.—Earl R. Goddard, Denver, Colo.

Retapping Threads in Nuts

When retapping damaged or undersized threads in nuts, holding the nut in a vise may result in a distorted or oval-shaped

hole. Instead, clamp the tap in the vise and run the nut on and off the tap with a socket wrench. Besides giving better results, this method saves considerable time when a number of nuts are to be retapped.

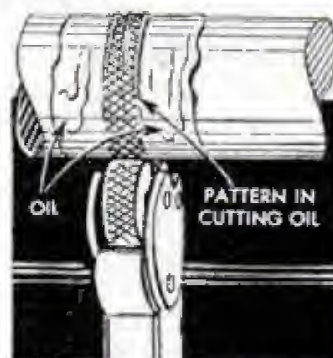
John Kretschmar, Monsey, N. Y.

Helpful Knurling Stunt

Here's a way to save time when using diamond knurls. Instead of making a test cut, stopping the lathe and inspecting the job before proceeding, first flood the work with lard oil and then engage the knurls.

As soon as the oil film forms into uniform rings around the work, throw in the power feed or traverse the carriage by hand. As long as the rings of oil form on the work you will know that the knurling pattern is tracking evenly, because if the pattern begins to "split" or overlap, the rings of oil will not form.

William S. Kals, Vancouver, Can.



Sawhorse Slotted to Hold Saw

One way to keep your saw at hand between cuts while still protecting the blade from possible damage, is to make a fairly long slot lengthwise through the top of the sawhorse. When finished with a cut merely lower the saw blade into the slot.

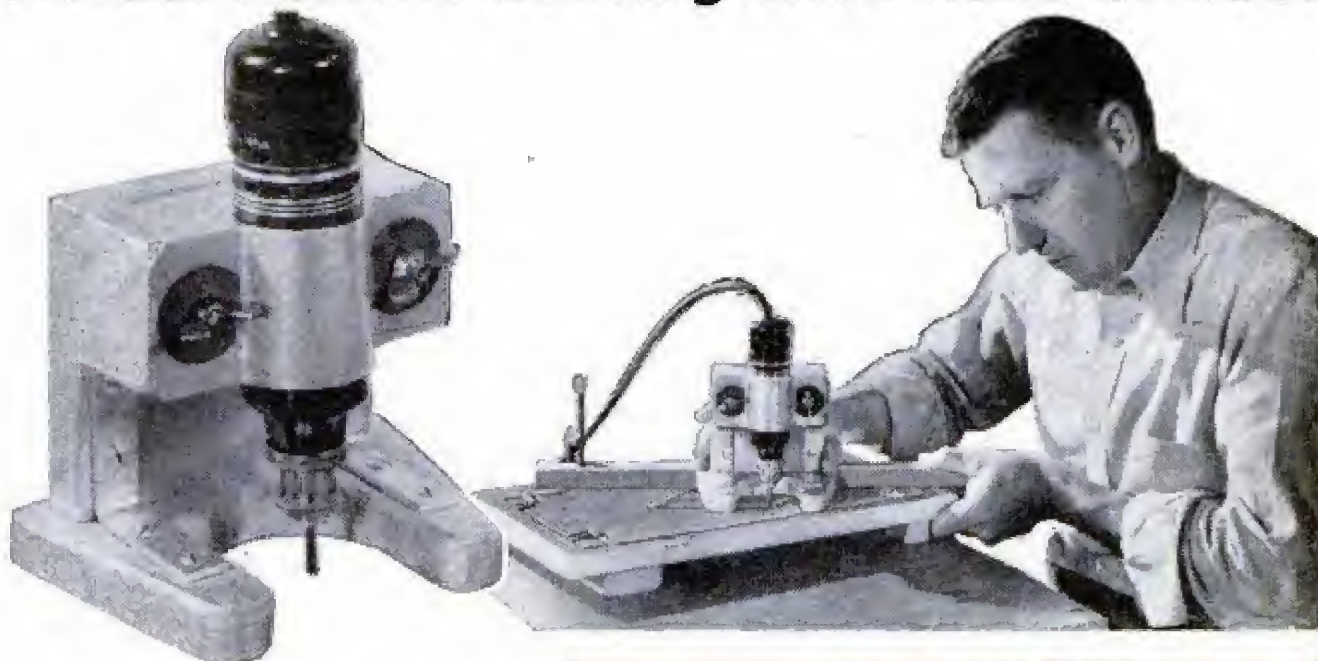
Movable Hog Wallow on Runners

This wooden hog wallow can be towed to any location and it's ideal for lime-sulphur dip or just to cool off the young pigs in hot weather. Two heavy runners support the box and the sloping ends are held watertight with long endgate rods. The type of construction used makes the wallow easy to dismantle should this be necessary.

A. M. Wettach, Mt. Pleasant, Iowa.

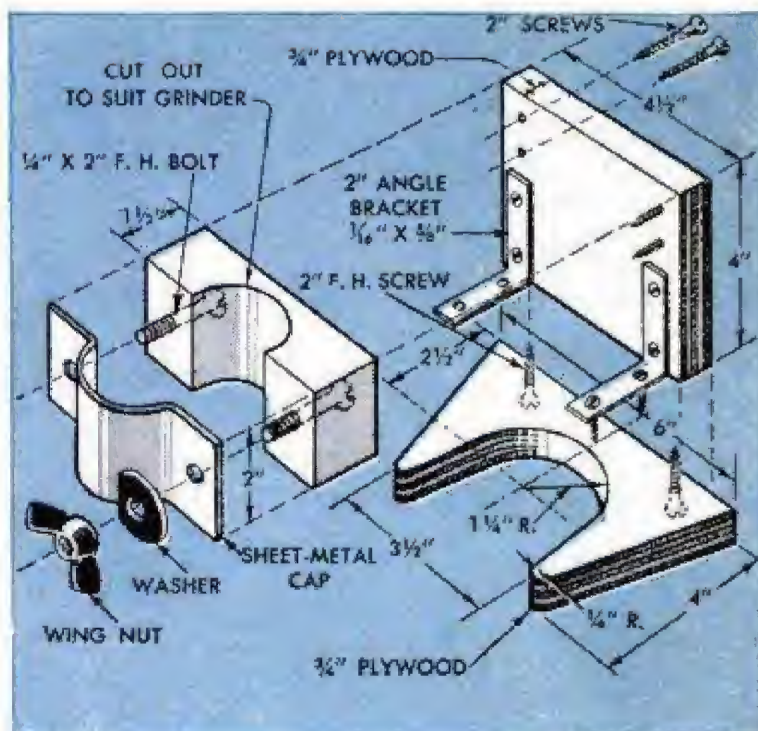


Holder Permits Routing With Hand Grinder

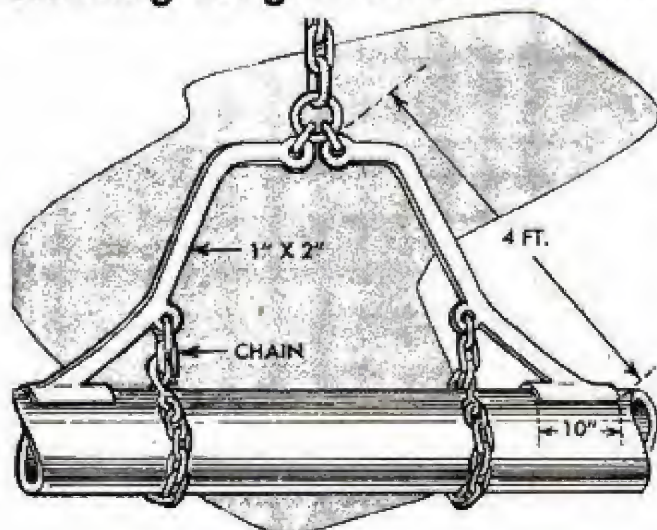


Here is an exceptionally useful jig that permits using a hand grinder for accurate routing to specific depths. In addition to ordinary routing jobs, it's ideal for intricate pattern work as it provides for maximum lateral control of the tool. The base and back of the jig are of $\frac{3}{4}$ -in. plywood and are fastened together with angle brackets. The holder for the grinder is formed by cutting out one side of a wooden block to suit the diameter of the grinder. Then a sheet-metal strap to clamp the grinder in position is bent, drilled and attached with wing nuts to bolts countersunk in the block. To use the jig, position the grinder in the holder to the proper routing depth and tighten both of the wing nuts.

E. R. Lucas, Poulsbo, Wash.



Hoisting Tongs Provide Safe Hitch for Lifting Heavy Pipe or Poles

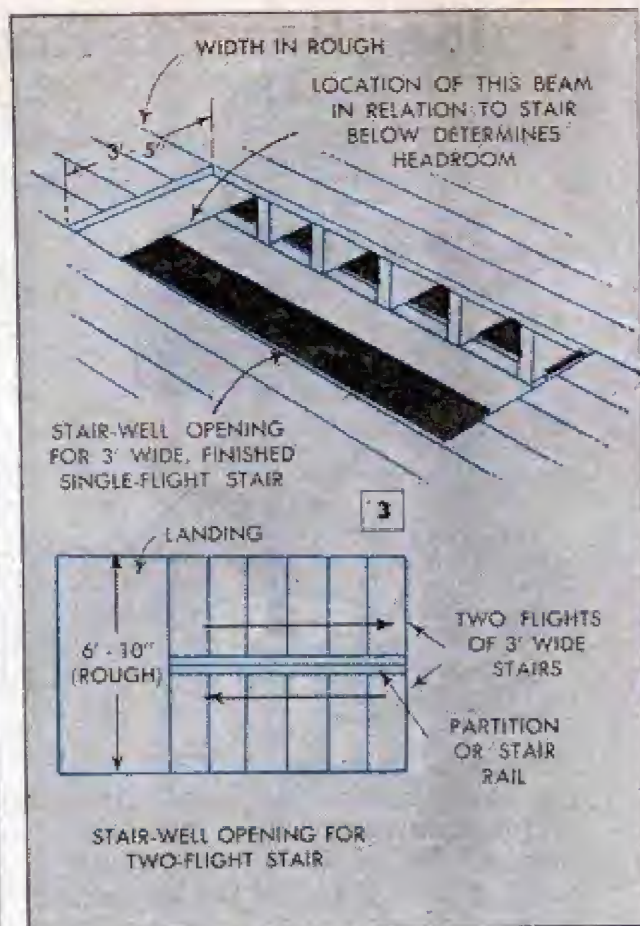
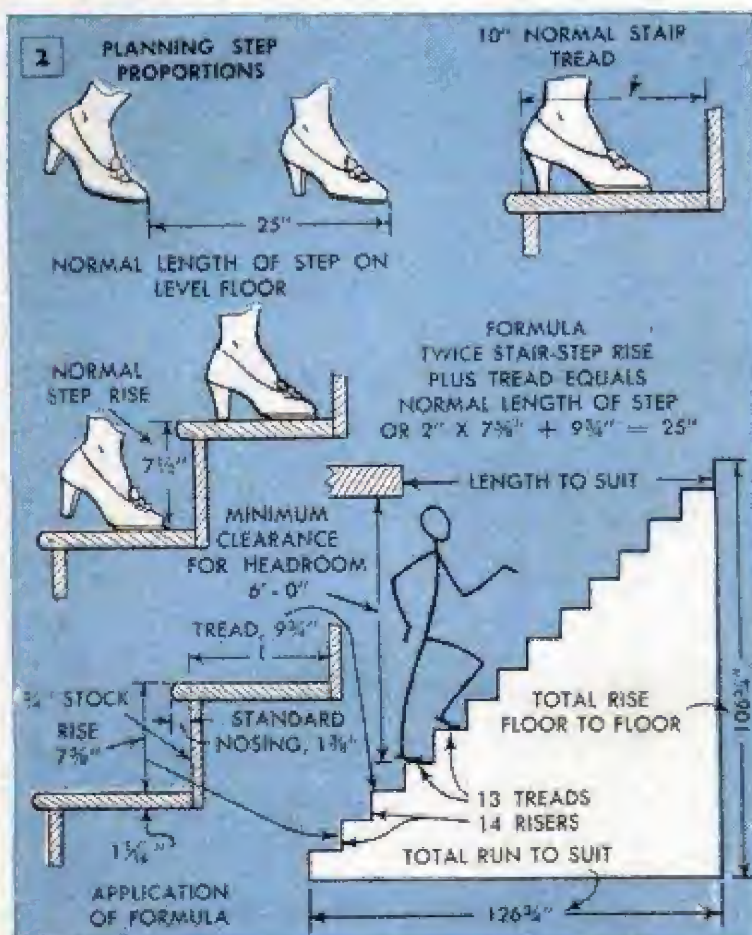


Designed and used by a western contractor engaged in loading power poles, these safe hoisting tongs work similar to a pair of ice tongs—the weight of the object tends to increase the grip. Chained to the load near the point of balance, the tongs keep the load in a horizontal position when lifted. The tongs are made from 1 by 2-in. flat iron, heated and bent to the shape shown. Eyes are welded to take a hoisting ring at the top and two grab chains which wrap around the load. Cupped saddle plates are welded to the ends of the tongs to ride the curvature of the particular pipe or pole being lifted.

William P. Houser, Organ, N. Mex.



Above, stair rails of the type shown consist of a number of pre-cut parts made from selected hardwoods. Below, layout of stair is based on normal length of step on a level floor



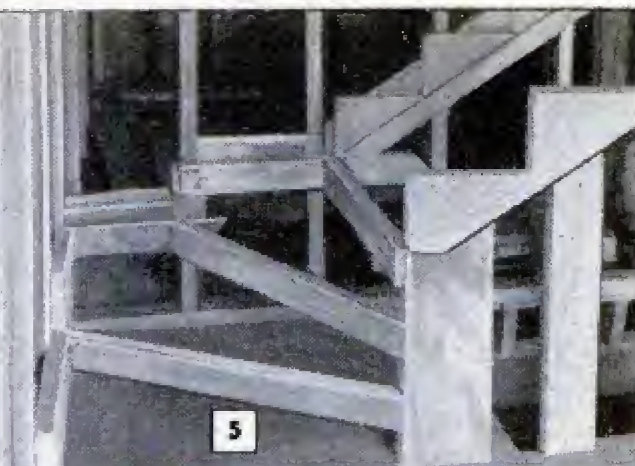
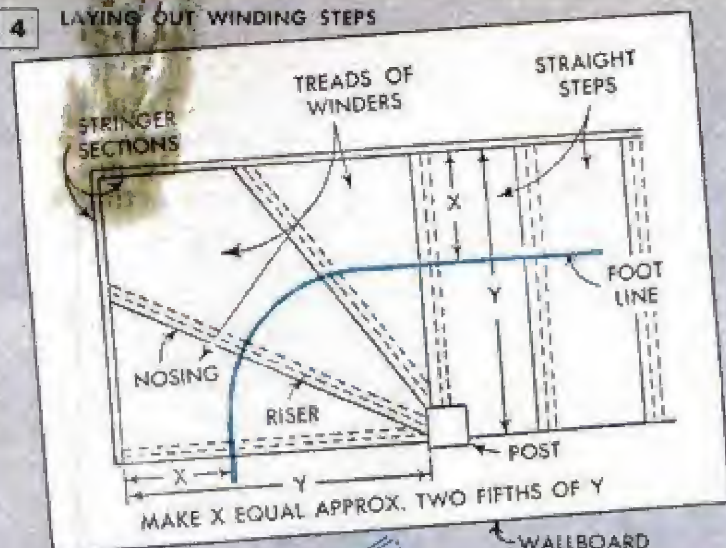
STEPS IN

INSTALLATION of a safe, attractive stair in either old or new homes is one of the most important details in the interior construction. Stairs that pitch too steeply, or those with abnormal treads and risers and insufficient headroom are a constant accident hazard. For safety, the stair must include all of the basic construction features detailed in Figs. 2 and 3. In the construction or remodeling of small and average-size homes in which stair space usually is limited, the two or three-directional, open-string stair with landings or winder treads often is best as it generally can be placed at the end of a room. In remodeling older homes it sometimes is necessary to use a single-directional closed-string stair, especially in large rooms.

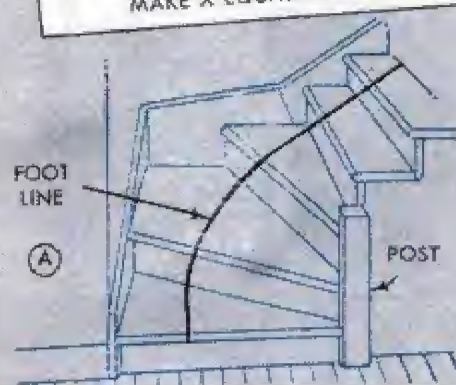
In determining the step proportions for an average stair, use measurements of the typical step shown in Fig. 2. These dimensions should not be varied more than $\frac{1}{2}$ in. either way, except in some special cases, such as on long flights made possible by ample space in large homes and buildings. On these stairs, a rise as low as 6 in.

4

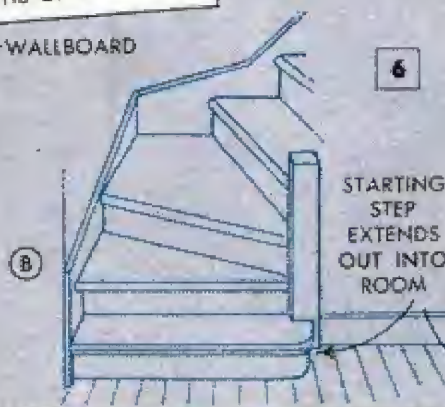
LAYING OUT WINDING STEPS



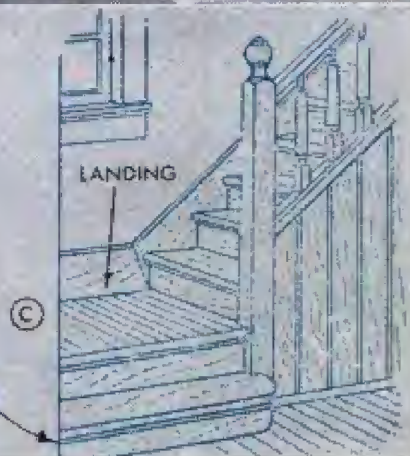
5



(A)



(B)



(C)

STAIR BUILDING

By
John Modroch

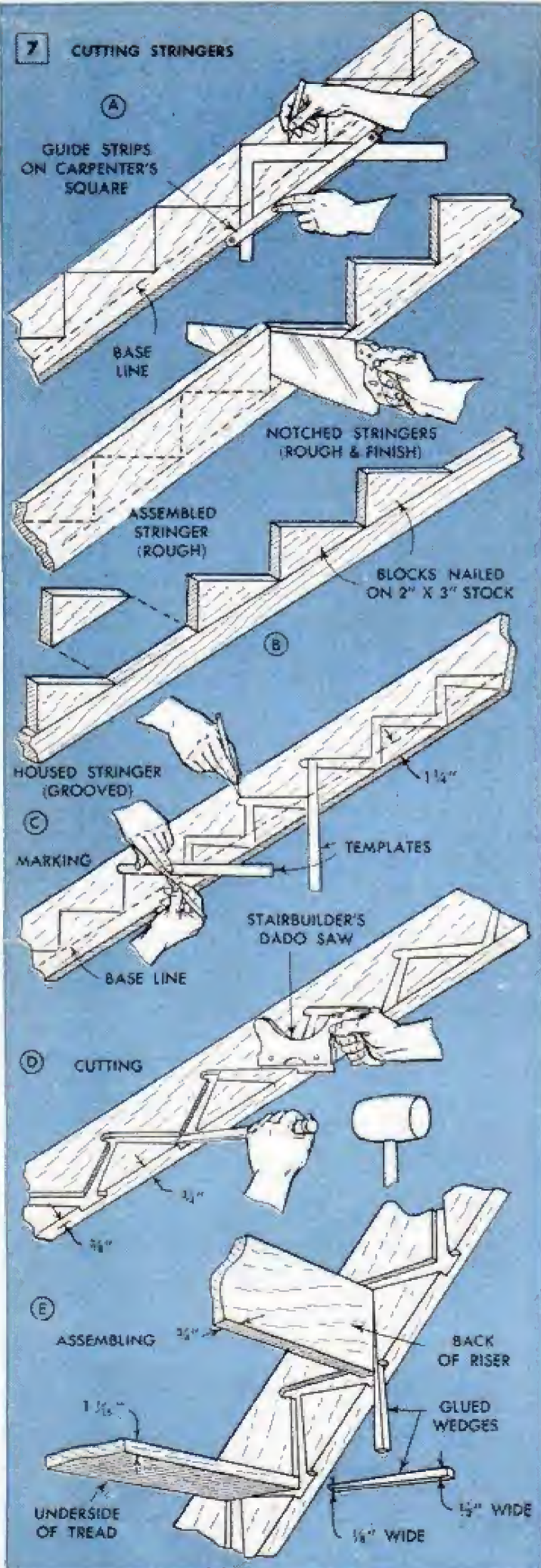
and a tread as wide as $11\frac{1}{2}$ in. may be used. Actual measurements will depend to some extent on how many steps of this proportion can be fitted into the stair space. To determine the number of risers for a given stair, first divide the total rise by the step rise, or a figure close to it that will give an even result. Then to get tread measurement divide the total run by the number of treads, which is always one less than the number of risers.

The stair opening, or well, should be cut wide enough and long enough to provide adequate headroom, Fig. 3. Remember also that dimensions of the opening must allow for the finish stringer, upper-floor nosing, and space for a rail. For example, the total finish allowance for the ordinary 36-in. single-flight open-string stair ordinarily would come to 5 in. These figures are based on $\frac{3}{4}$ -in.-thick plaster wall and a standard $2\frac{3}{8}$ -in.-wide rail, plus 1 in. minimum finger room between the rail and wall. Always check walls of the stair well with a level and straightedge to determine beforehand the allowances for out-of-plumb walls, corners and other irregularities.

In planning the installation of a stair in a new location, which often is done in making alterations in old houses, obstacles that interfere with the placement of the stair well may be encountered. These may be

supporting main beams or joists, chimneys or other installations that cannot be moved. If the obstacle is at one end of the proposed opening, the loss in length sometimes can be compensated for by shifting the location of the stair in the opposite direction. If this cannot be done, then winding steps or landings, Figs. 4, 5 and 6, sometimes can be installed. However, there is a definite minimum total run as well as a minimum headroom. Built to any dimension under these limits, the stair is not only difficult to ascend or descend but actually may be dangerous in some locations. Fig. 6, A, B and C, detail the commonly used methods of building approaches to both open and closed stair flights. In detail A, three winder treads are used. Winders are tapered steps which pivot at the newel post. Here the nosing of the winder starting step is flush with the stair wall. Better construction is shown in detail B where the starting step is straight and extends its width into the room. Somewhat simpler construction of the open-string stair employing a landing is indicated in detail C. In laying out winders, the plan should be drawn full size as in Fig. 4. The tread width of winders is gauged by intersecting the foot line, which represents the normal path of travel on winding steps, with a compass set to the tread width of the straight steps.

7 CUTTING STRINGERS



Only thoroughly seasoned lumber should be used in building a stair. Treads and risers in standard lengths and widths may be purchased. Treads preferably should be oak, dressed to $1\frac{1}{16}$ -in. thickness. Risers usually are cut from pine, $\frac{3}{4}$ in. thick. Starting steps, built with curved ends to match standard rails and newel posts, nosing returns and cove moldings, also are stock items. Clear $\frac{3}{4}$ -in. pine boards commonly are used for making finish stringers. Rough stringers are cut from 2-in. stock.

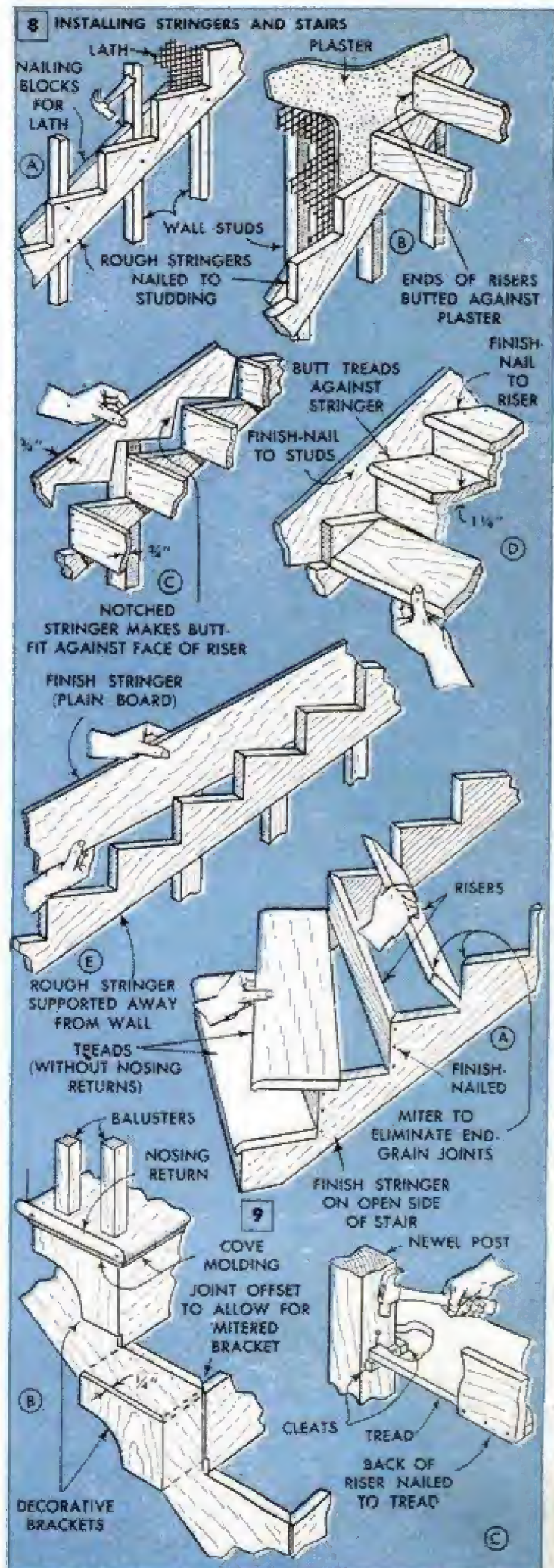
In building a stair, make the stringers first. They may be the open or notched type, details A and B, Fig. 7, or the housed type, detail C, depending on the method of stair installation. On either type, begin by laying out the rise and run of each step as in detail A. On a notched stringer make the saw cuts shown. On a housed stringer, locate and pencil the outlines of the grooves with the aid of two templates, one for the tread grooves and one for the riser grooves, as in detail C. Both templates must include an allowance for wedges, Fig. 7, E. When the layout is completed cut the grooves as in detail D. Be careful when chiseling out the waste to bring the grooves to a uniform depth. At this stage, cut risers and treads to width, but not to length unless the stair is to be assembled beforehand and installed as a unit.

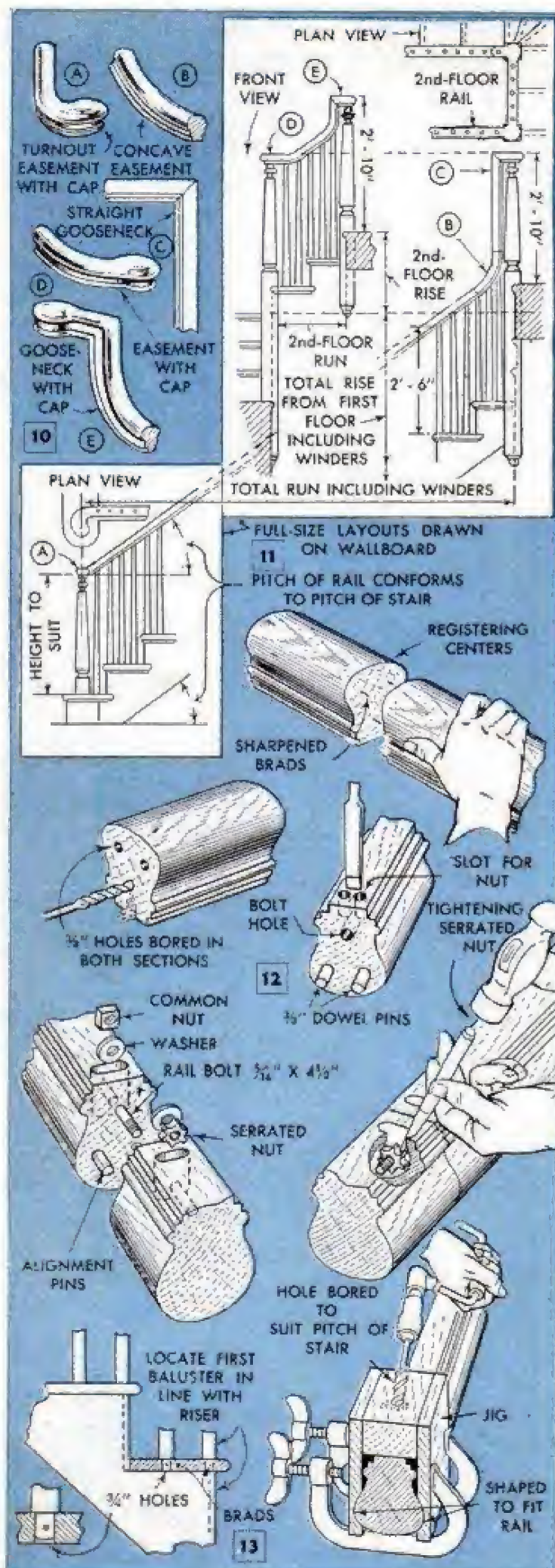
To avoid damage resulting from exposure to moisture in a new-house installation, the stair should not be installed until after the rooms have been plastered and have had time to dry out. However, where the rough-stringer method of construction is used, the stringers may be put in beforehand and temporary tread boards nailed on so that the stair can be put into immediate use. Finish the stair after the plastering is completed and thoroughly dried.

To install a closed-string stair in a plastered stair well, fasten the stringers to the walls by nailing through the plaster into the studding. Next, cut the treads and risers to length and wedge them in the grooves as at E in Fig. 7. Set the wedges in glue and be especially careful to drive them to a uniform tension. Where it is practical to support a notched wall stringer away from the wall, E in Fig. 8, a plain board can be used as the finish stringer, thus eliminating the need for notching or grooving. Slip the board down into the space between the

notched stringer and the wall and fasten with finishing nails driven through the plaster into the studding. Then install the risers and treads by butting them against the finish stringer instead of the plaster. Other methods of installing notched stringers are shown in Fig. 8, details A, B, C and D. A method of miter-joining the risers to notched stringers is shown at A, Fig. 9. The use of decorative brackets, detail B in Fig. 9, simplifies the miter-joining of risers and finish stringers on the open side of the stair, making it somewhat easier to produce neatly finished edges, and affording a simple means of correcting open joints caused by errors or inequalities of lumber. Anchor newel posts to the stair structure as shown in Fig. 9, detail C. If the installation permits working under the stair, the groove-and-wedge method as used with housed stringers may be employed for anchoring steps to posts, instead of the cleat-and-nail method shown at C. Wedges produce a tighter job. When installing a stair on subflooring, which is common practice, be sure to allow for the thickness of finish flooring by making corresponding increases in the width of the bottom riser and the length of the stringers and newel post.

An attractive stair rail not only is of decorative value, but it's an essential part of every stair as it reduces the accident hazard to the minimum. The rail must be rigidly mounted on newel posts that have been firmly anchored in the stair structure, and it should be capable of withstanding more than normal strain. To aid stairbuilders in doing good rail jobs at reasonable cost and with a minimum of hand work, ready-made rails are preferable for use on stairs of common measurements. These come in sections that are assembled on the job. Matching newel posts and balusters should be obtained with the rail. If the stair follows a normal layout with average run-and-rise measurements, it is easy to fit these standard parts. To determine the dimensions of parts needed, draw full-size plan and elevation layouts. A typical layout of the balustrade is shown in Fig. 11, the parts lettered A to E inclusive, Fig. 10, being shown in position in the plan view, Fig. 11. A common procedure is to assemble the rail in flight units, beginning at the lower, or starting, newel. First bolt the easement section of the rail to the starting newel cap. Join the gooseneck section of the





rail to the landing-newel cap. Then bolt the cap-and-easement units temporarily to the straight rail section, hold the assembly on the newel posts as in Fig. 1, and check the rail for length. Straight sections are joined with dowels and special stair-rail bolts as in the five steps shown in Fig. 12. Finally, complete the flight assembly by bolting on the cap-and-gooseneck unit. Assemble any succeeding flight units in the same way. In those styles where easements and goosenecks are not employed or in cases where factory-joined units are used, some of these special operations are unnecessary, of course. After the parts have been fitted and bolted together, fill openings and screw holes either with wooden plugs glued in, or with wood putty.

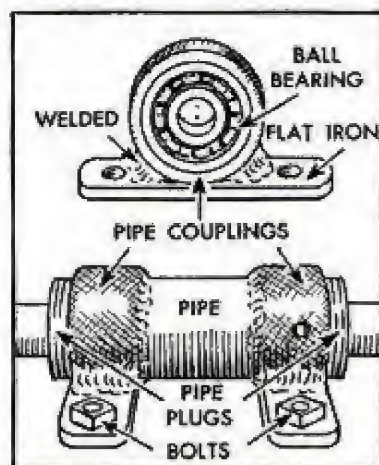
Balusters are fastened to rails in either of two ways, depending on the style employed. Square balusters, made to fit grooved rails, are held in position by means of spacers, or fillet strips, which are inserted between the balusters. Turned balusters are designed to fit into holes bored in the rails as shown in Fig. 11. Balusters of three different lengths are required for each step except the step directly under an easement, which takes a fourth size of extra length. To locate baluster holes on the rail, set it in place on the posts. Then raise plumb lines from the baluster holes in the step treads up to the rail, using a carpenter's level. Boring the holes at the required angle can be done accurately on the straight sections of the rail with the aid of the simple boring jig shown in the right-hand detail in Fig. 13. Holes in the curved sections of the rail must be bored freehand. In spacing balusters, locate the first one on each step in line with the riser as shown in the left-hand detail in Fig. 13.

Before preparing a newly built stair for painting or varnishing, allow time for the wood to become adjusted to the atmospheric conditions in the house. Otherwise, slight shrinkage may loosen the filling in the joints and spoil the paint job. For this reason, it is best to do all other decorating work in the house first, leaving the stair to the last. Meanwhile, protect the treads from dirt and scuff marks by covering them with heavy paper held in place with cellulose tape. In painting the stair well do not get paint on the stair parts as it will be difficult to remove.

Ball-bearing pillow blocks and arbors were made by one man at a fraction of the purchase price, using secondhand ball bearings mounted in sections of pipe coupling. He selected a pipe coupling with an inside diameter the same or a little smaller than the outside diameter of the bearing. Then he cut the coupling in two, using one half for each bearing housing, and filed down the threads to provide a press fit for the bearing. This section was welded to a piece of flat iron drilled near each end to permit bolting in place.

He made the arbor by welding a piece of pipe between two pillow blocks. Then, removing the square portion from two pipe plugs, he drilled holes through them slightly larger than the arbor. One of these plugs was screwed into each housing, a heavy felt washer being used between the ball bearing and plug to serve as a grease re-

Pipe Fittings and Flat Iron Provide Housings For Ball-Bearing Pillow Blocks and Arbors

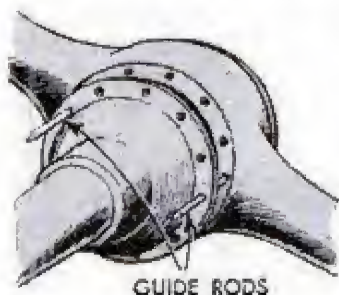


tainer. The unit is drilled and tapped for a grease fitting. The pipe plugs should tighten against the outer races of the bearings to keep them from turning. If desired, the bearing also can be clamped by inserting a setscrew through a hole drilled and tapped in the side of each coupling.

D. C. Marshall, Manhattan, Kans.

Drive Shaft Aligned to Differential With Aid of Guide Rods

Difficulties often experienced in attaching the drive-shaft housing to the differential housing can be overcome by using guide rods made from long stud bolts or regular bolts with the heads cut off. In either case, the projecting ends of the rods

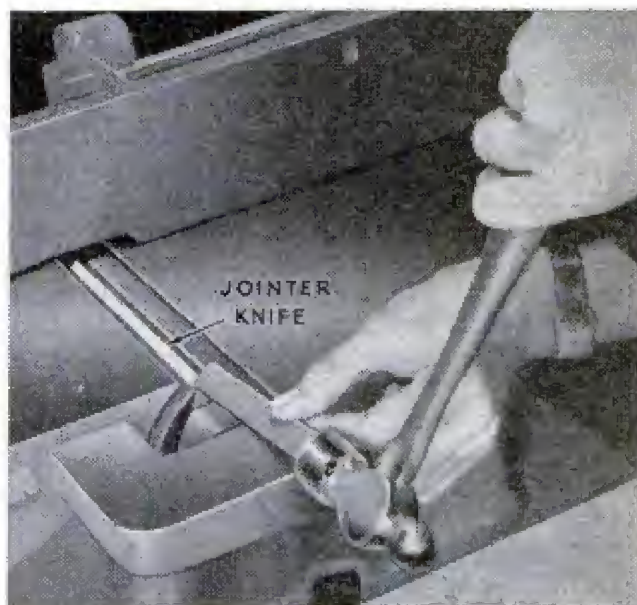


should be ground to a taper point to aid in starting them in the holes in the drive-shaft housing. Two rods are required and are turned into the cap-screw holes in the differential housing, locating

them opposite each other. In use, the drive-shaft housing is lined up in its proper position, then slipped over the guide rods and pushed into place. After a few of the cap screws have been driven, the guide rods can be removed. This method makes it unnecessary to twist and jiggle the drive-shaft pinion and housing assembly to get it in alignment with the differential.

D. W. Brentlinger, Richmond, Calif.

When new spark plugs are installed, they should be properly tightened in the engine block. This is particularly important if all-copper gaskets are employed.



Adjusting Nicked Jointer Knives Results in Smooth Cut

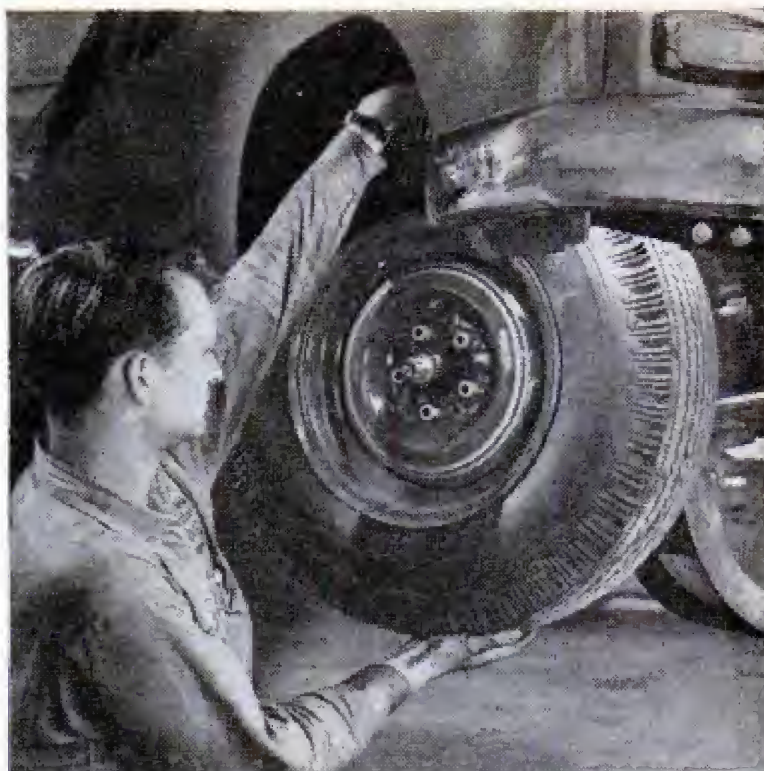
It's not always necessary to regrind nicked jointer knives to obtain a smooth cut. As the knives usually have $\frac{1}{8}$ -in. clearance at the ends, it is possible to move them laterally in order to stagger the nicks, so one knife will remove the slight ridges formed by the other knives. To do this, loosen the clamp screws and tap the knives lightly with a piece of brass and a hammer. After moving, the knives must be reset carefully to the proper height.

Henry Hanscom, Elmhurst, Ill.

SERVICING WHEEL BEARINGS

Like any fine mechanism, wheel bearings need attention to withstand constant use. Proper adjustment, cleaning and lubrication keep them in top condition

By Phil Ruskin



Kaiser-Frazer Corp. photo

Testing front-wheel bearings for looseness by rocking wheel. Do not mistake kingpin movement for wheel-bearing looseness

ROLLING contact bearings on each of the four wheels support the entire weight of a car. These bearings are expertly designed and engineered for extremely long service, and with only occasional attention they usually last for the life of the car. Under ordinary conditions, it is advisable to remove the wheels and inspect and clean the bearings at least once a year—oftener under extreme conditions.

The most common causes of bearing malfunction are: (1) rust due to worn or defective seals or condensation inside the housing; (2) worn, galled or abraded surfaces resulting from too loose a fit or dirt lock; (3) broken or bent inner ring, shields,

seals or separators caused by improper or careless installation, and (4) damaged raceways, balls or rollers due to dirt or pitting by corrosion. Badly discolored balls and races indicate inadequate lubrication. Dirt or pitting by corrosion is indicated by a general roughness, and excessive looseness or end play is evidence of lapping by dirt or abrasive. Parts are a dull-gray color when lapped or abraded by dirt.

The principal parts of a ball bearing are shown in Fig. 4. Variations of this bearing will be found in the different makes of cars, but basically they are the same. Wear is virtually absent unless foreign matter finds its way into the bearing. However, any



Soft brush assists cleaning of bearings in gasoline. After washing, handle parts only when necessary



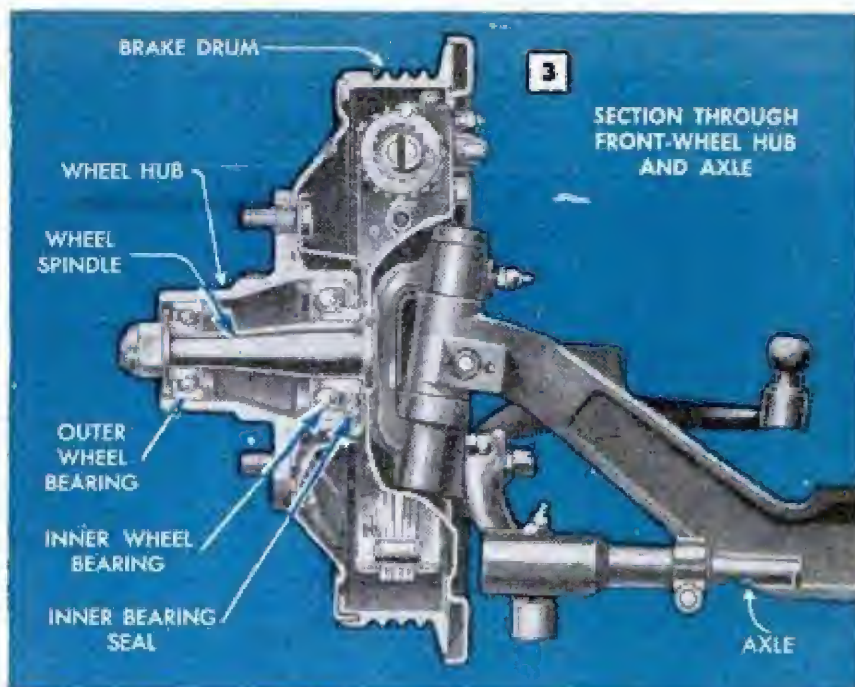
Bearing is packed with wheel-bearing grease made especially for purpose. Substitutes should not be used

abrasion or injury to the surfaces may lead to bearing failure, and hitting or dropping a bearing is likely to damage it beyond repair. Also, incorrect kind or amount of lubricant may cause heating or corrosion.

Fig. 3 shows a typical bearing arrangement for the front wheels. To service these bearings, jack up the wheel and remove the ornamental cover and hub cap, if any. Next, remove the cotter pin from the spindle nut and unscrew the nut. Pull the wheel off slightly to loosen the outer bearing and then push the wheel back in place. Carefully remove the outer bearing and place it on a clean piece of paper. The wheel can then be completely removed from the axle. Now, slip the inner bearing and grease retainer from the hub and place them on the paper also. After this, all parts, including the wheel hub and axle spindle should be thoroughly washed in white gasoline and allowed to dry, Fig. 1. Do not handle the bearings more than necessary after cleaning, as perspiration tends to corrode them. Inspect the grease retainer and brake assembly for grease leakage. As this retainer keeps the lubricant within the bearing area and away from the brakes, it should seal tightly. Inspect the bearings for wear and damaged balls or rollers and check for play between the balls and races. However, do not spin the bearing before it has been lubricated. Coat the bearings and the axle spindle with wheel-bearing grease, Fig. 2, but do not use ordinary chassis lubricant or other substitutes. If new bearings are necessary, be sure to get duplicates of the ones being discarded.

To reassemble the parts, first press the inner bearing and grease retainer into the hub. Mount the wheel on the spindle, being careful not to damage the grease retainer, and insert the outer wheel bearing, applying the spacer washer and castle nut. Rotate the wheel slowly, tighten the nut until the wheel just binds and then back off the nut slightly to insert the cotter pin. Check for bearing looseness by rocking the wheel, but first block the kingpin or have someone watch it, so that kingpin movement is not confused with bearing looseness. With the bearing properly adjusted there will be a slight drag when the wheel is turned slowly by hand. When the adjustment is right, secure the cotter pin.

The rear-wheel bearings, Fig. 5, do not require attention as frequently as those on the front wheels. The parts of the rear-wheel assembly are cleaned and the bearing checked in much the same way as those of the front wheel. However, a wheel puller will be necessary to remove the wheel. Probably a puller will also be needed for the bearing. If the bearing is lubricated by high-pressure grease fittings, be careful not to apply too much grease.



General Motors Corp. photo

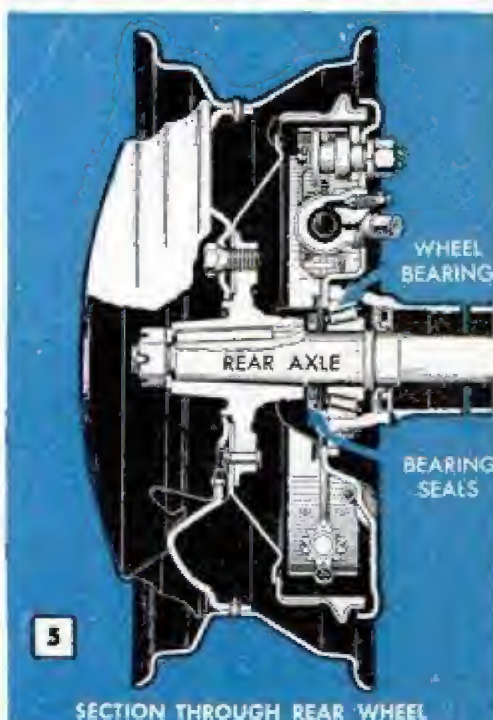
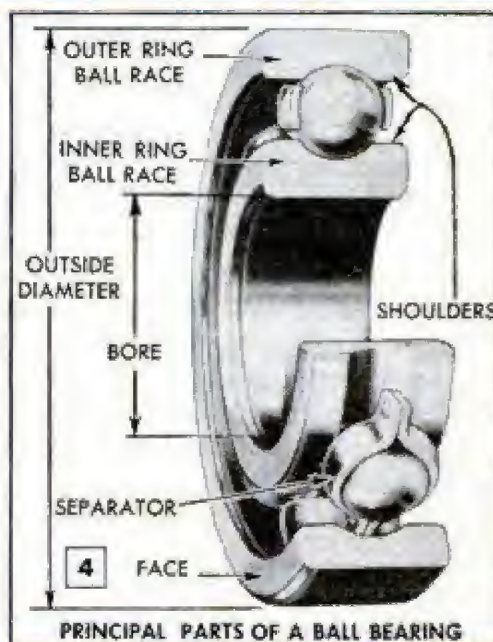
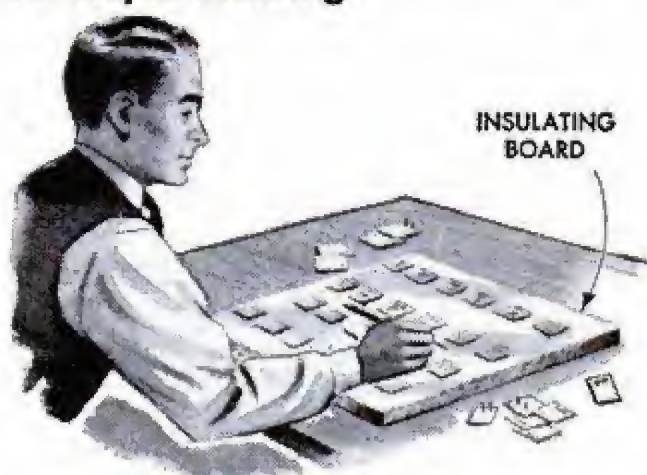


Diagram courtesy Packard Motor Car Co.

Insulating Board Holds Pin Tags For Rapid Marking



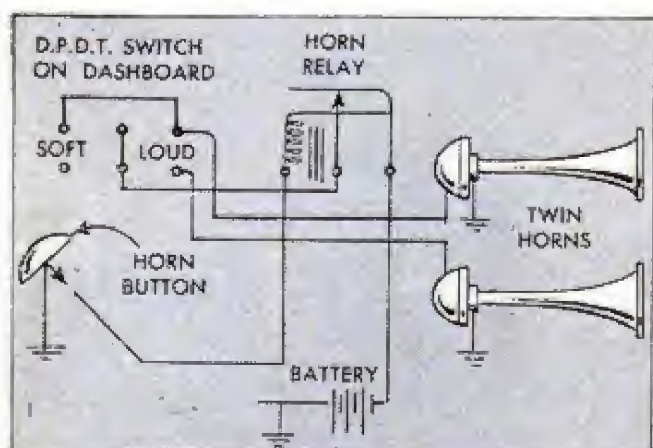
Not only was the job of marking prices on pin tags expedited by one merchant, but he also lessened the danger of injury to his fingers on the sharp ends of the pins. This was done by arranging a number of the tags in rows on a piece of soft insulating board. These were held fast by pressing the pins into the board, and after the tags were marked, they were easily pulled off the board.

G. E. Hendrickson, Argyle, Wis.

Compressed Air Helps Rewire Car

After several futile attempts to pass a wire through a channel in a car body, one mechanic hit upon the idea of using compressed air to do the job. First, he tied a small piece of cloth to the end of a length of string and placed the cloth in the channel. Next he blew the cloth through the channel with a jet of compressed air. Then the other end of the string was tied to the wire to permit pulling the latter through the channel.—Ed Packer, Chicago.

Throw Switch in Horn Circuit Regulates Volume



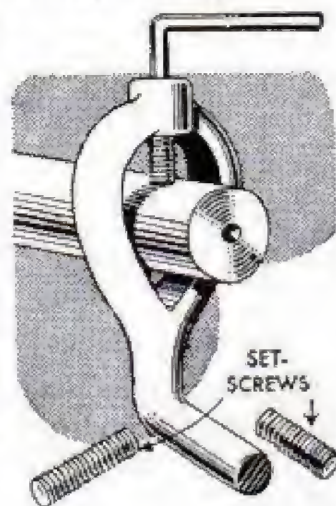
If you have dual horns on your car which are too loud for city driving, the volume can be controlled by installing a d.p.d.t.

(double-pole, double-throw) switch in the circuit, as shown. Where maximum volume is unnecessary or not permitted, just set the switch to allow only one of the horns to sound. Then, when you're out on the highway, both horns are sounded simultaneously by throwing the switch.

Fred Lettino, Long Island City, N. Y.

Setscrew Replaces Clamp Bolt To Increase Lathe-Dog Safety

Whenever a lathe dog is used there is the possibility of the clamp bolt injuring the operator. To avoid this danger, replace the clamp bolt with a socket-head setscrew, using a screw that does not project above the surface of the dog.—Richard Hanscom, Elmhurst, Ill.



Short Cuts Speed Inventory Of Stacked Materials

Here are two short-cut methods for counting stock piles of pipe, tubing, iron rod, etc., when taking inventory. To find the total number of items in a pyramid-



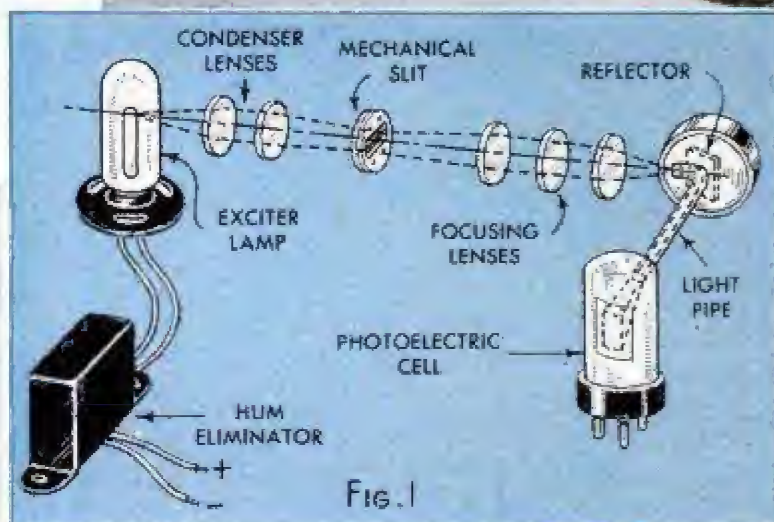
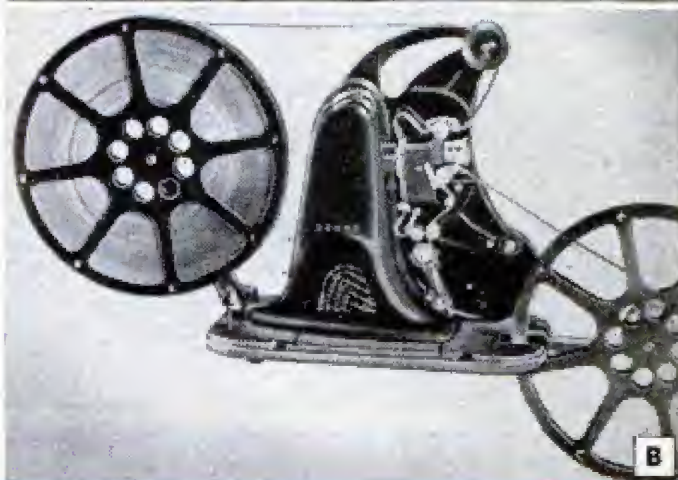
shaped pile, it is necessary to count only the bottom row, multiply that number by a number that is one greater and divide by 2. For example, Fig. 1 shows 7 pieces in the bottom row. One number greater than 7 is 8. Seven multiplied by 8 equals 56. This divided by 2 equals 28, or the number of pieces in the pile. To find the total in a pile stacked as in Fig. 2, count the number of units in the bottom row, then the number of complete rows and finally, the number of pieces in an incomplete row or rows. Thus, in the example, Fig. 2, 20 is multiplied by 2. Then the number of complete rows minus 1 is subtracted from 40 giving 35, after which this figure is multiplied by half the number of complete rows, in this case, 3. Then to the product of 105 (35 times 3), add the number of pieces in the incomplete row, which is 4, making a total of 109 pieces in the pile.



'Wireless' Sound-Movie Projector

UTILIZING your home radio for amplifying the film sound track, this 16-mm. sound-movie projector actually "broadcasts" the recorded sound to your receiver where it is picked up and played through the set. You merely tune your receiver to a dead spot and the sound comes out of the loudspeaker. There are no connecting wires or attachments between the projector and the radio set. A 12BE6 tube is employed as an oscillator and a 12AU6 serves as an audio amplifier. Photo A shows the projector in operation, with the receiver at the right of the screen.

Doing away with the delicately adjusted parts in the usual scanning system, graphically illustrated in Fig. 1, this Apollo projector uses a special type of photocell in an infrared-ray scanning system which employs the three tiny parts shown in photo D. The projector weighs about 16 pounds. Additional features include a 2-in. f:2 fully achromatic coated lens, 500-watt projection lamp, and improved high-lumen shutter. Photo B shows the projector equipped with extension arms for 2000-ft. reels. The 200-ft.-reel assembly appears in photo C. The instrument is instantly convertible from sound to silent speed projection.



Portable 3-Tube Phono Player

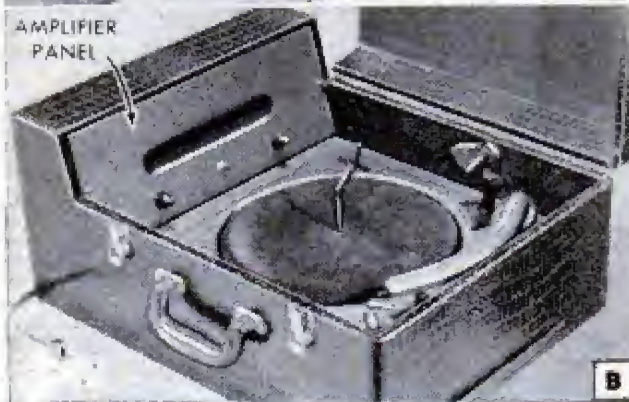
By Arthur I. Rattray

HERE is an automatic record player and amplifier that is easily portable. It also has eye appeal and gives you good quality reproduction. It may be operated in any location where a 110-volt, 60-cycle a.c. line supply is available. Ideal for small dancing parties or for playing favorite record-album selections, you merely plug it into a socket and it plays 12 ten-inch or 10 twelve-inch records one after the other with the lid closed. The volume is sufficient for a large room.

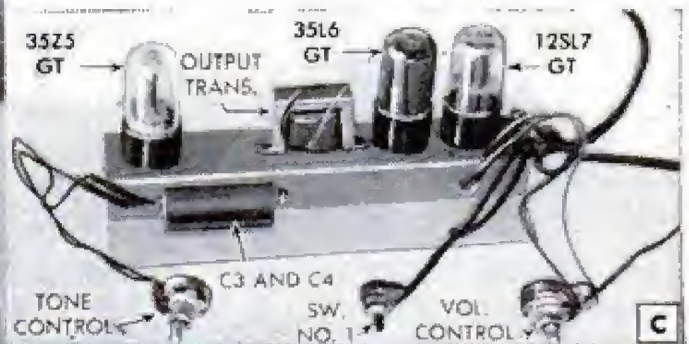
It employs a 3-tube, high-gain audio amplifier and a 6-in. permanent-magnet (PM) speaker that delivers surprising power without distortion. There is a separate tone-compensating control, volume



A



B



C

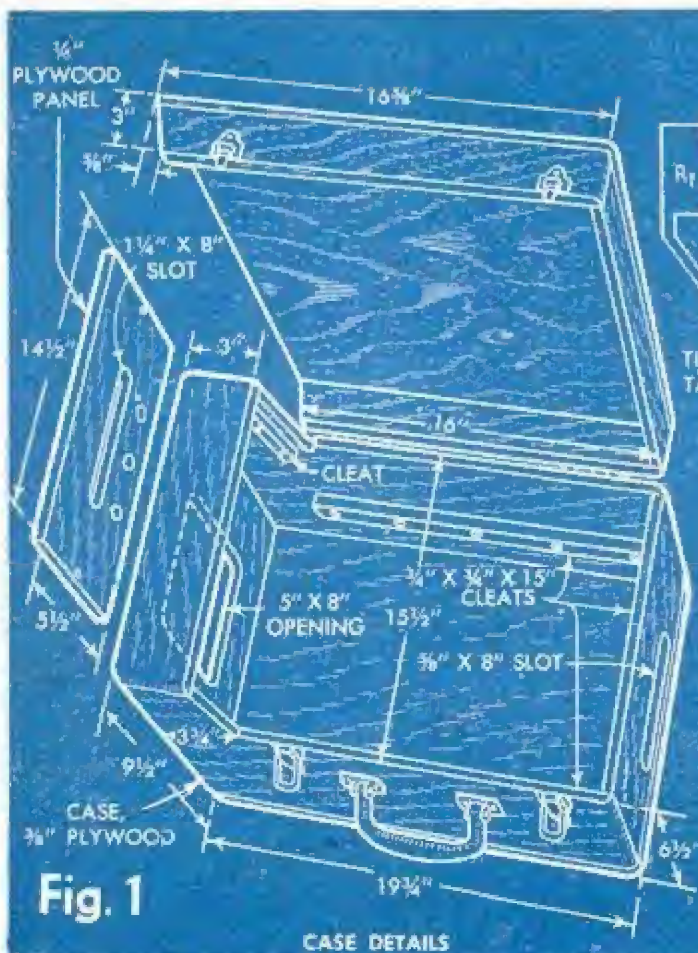


Fig. 1

CASE DETAILS

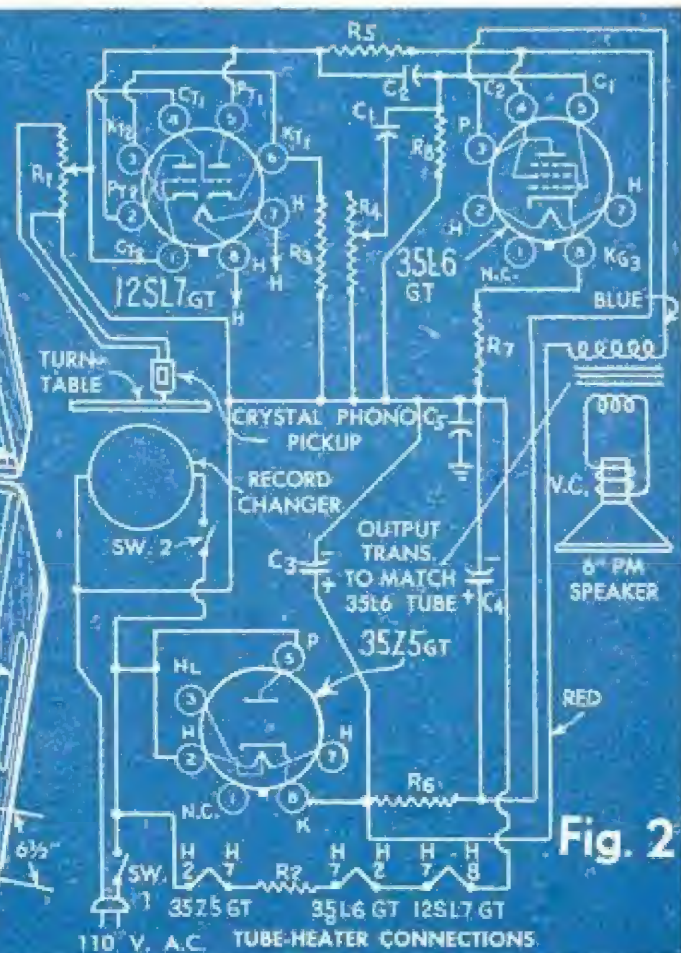


Fig. 2

TUBE-HEATER CONNECTIONS

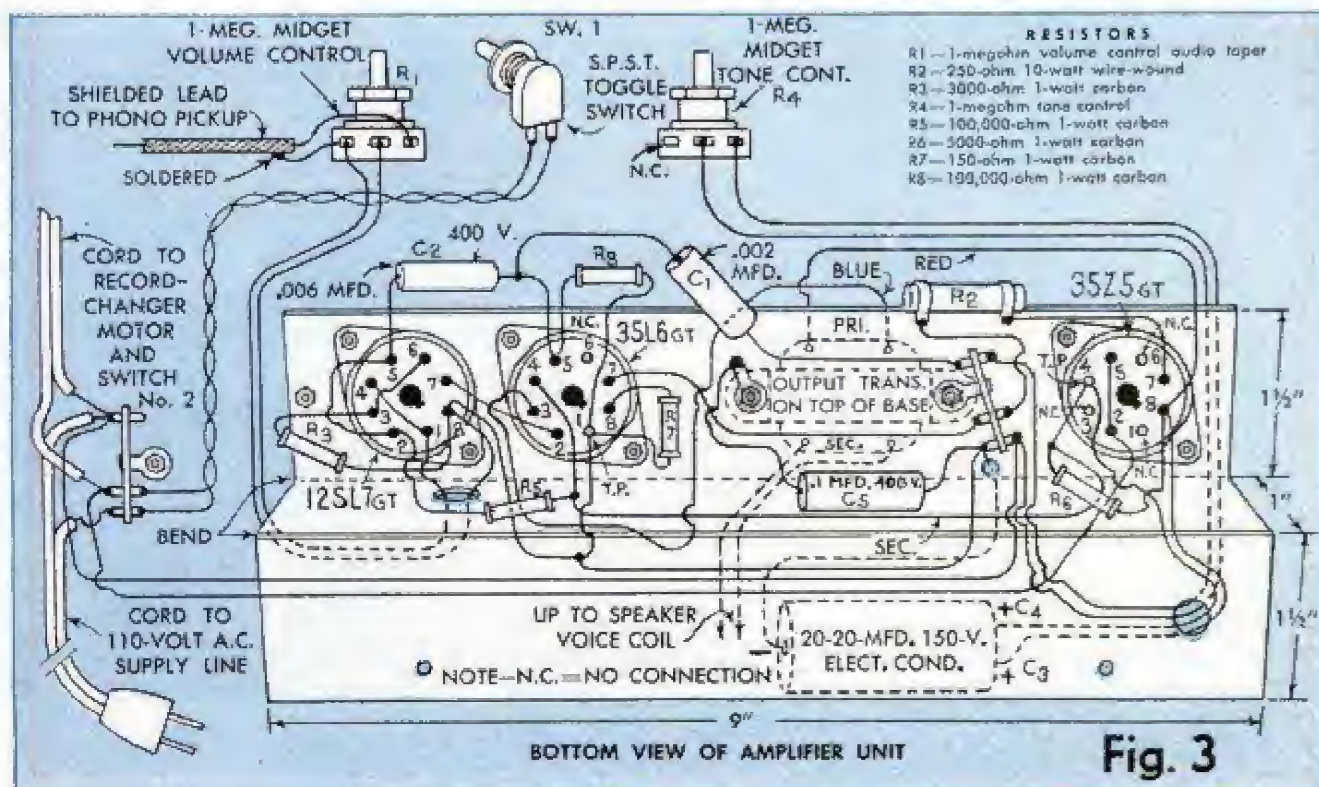
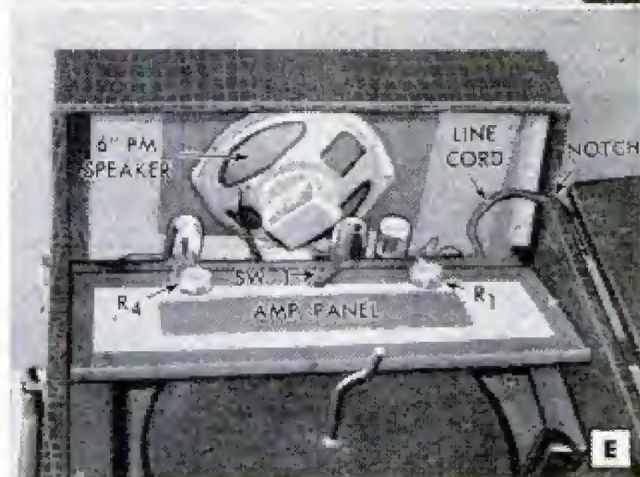
With Automatic Record Changer

control, and on-off switch. These controls are mounted on a convenient panel on the inside of the case directly in front of the audio amplifier at the left of the turntable, as indicated in photo B. With the lid closed as shown in photo A, the complete automatic record player with built-in amplifier is not much larger than a suitcase.

A standard case of this type is available from all radio-parts houses or, if the builder wishes to construct his own, it can be made of plywood as detailed in Fig. 1. It may be covered with imitation leather or it can be hand rubbed, stained and given a wax or varnish finish if preferred. The speaker opening, and ventilation slots in the case and the control panel are backed with pieces of brown-flocked grille screen. A mounting board for the record-changer mechanism is also made of plywood. The shape and size of the opening will depend upon the type of record changer used. The manufacturer supplies a template with each unit. The one used in the model is a Webster type 50, mounted as shown in underside photo G.

The schematic circuit diagram is given in Fig. 2. It employs one 12SL7-GT high-mu twin triode tube, a 35L6-GT beam-power amplifier tube and a 35Z5-GT half-wave rectifier. Please note that the tube heaters are connected in series, with the 250-ohm 10-watt wire-wound resistor R2 following the 35Z5-GT rectifier tube.

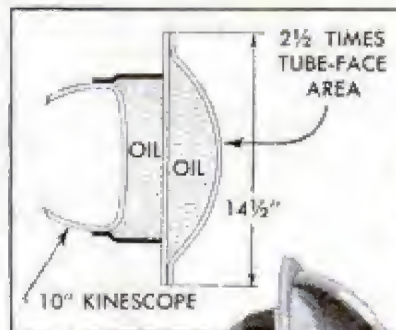
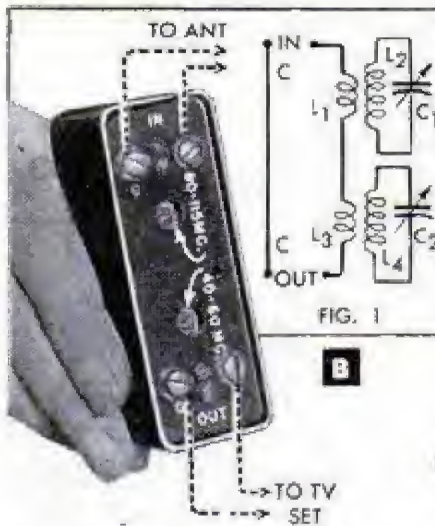
(Continued to page 226)



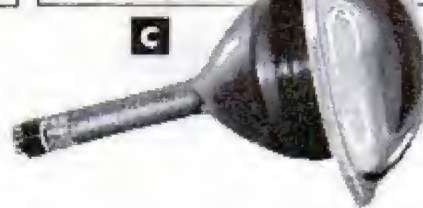
TELEVISION TODAY



A—Two-unit experimental portable television receiver gets a tryout on the beach at Steeplechase Park, Coney Island. Intended for use at picnics, beaches or on boats where power lines are not available, this set is operated with a separate portable power unit which may be seen behind the receiver. The 3-in. screen is located at upper right in the TV set. All controls are simplified and mounted on the front panel within easy reach of the operator. Both units are housed in neat sheet-metal carrying cases



B—Interference filter for television sets consists of a "Teletrap" designed to eliminate spurious signals that result in lines, bars or other patterns that interfere with the clarity of TV images. It is claimed to eliminate signals coming from old-band FM and 6-meter "hams"



C—"All-Vue" lens made of Lucite, liquid filled and permanently sealed. Spherically designed for optical vision at any angle up to 180 deg., it employs a black collar to connect the picture tube with the lens which is prefocused. It enlarges the TV picture $2\frac{1}{2}$ times

D—Television filter designed to end eye fatigue and improve viewing conditions. It consists of a neat, clear plastic frame fitted with a highly polished sheet of amber Lumarith cellulose transparent material. A cord holds the frame over the TV receiver screen

E—TV receiver installed on rear of driver's seat in taxicab provides entertainment for riders in a satisfactory Chicago test. The Motorola TV table-model set employs 6-volt tubes and a Mallory "vibrapak" for power supply. A special antenna was used to cover all TV channels



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Here's the very latest thing in folding cameras—newly designed, smartly styled, and equipped to help you get a better picture on every shot.

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"Kodak" is a trade-mark

A—Bracket takes accessory range finder

B—Bed shutter release gives steady control

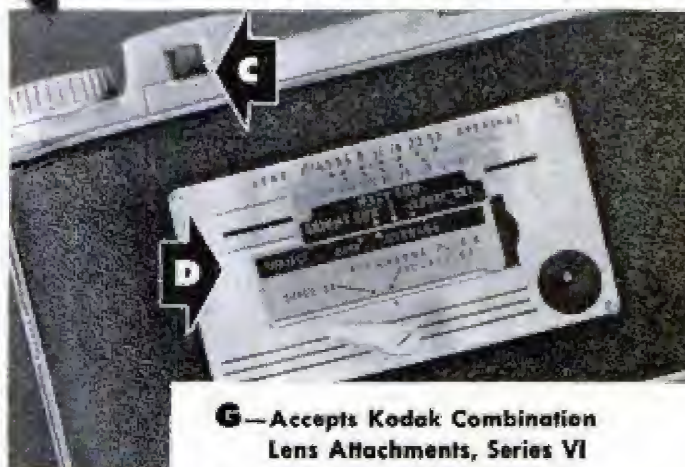
C—Built-in view finder permits rapid framing

D—Sliding computer simplifies exposures



E—Synchronized Flash Kodamatic Shutter—1/200

F—Depth-of-field scale etched on lens mount



G—Accepts Kodak Combination Lens Attachments, Series VI

H—Uses Kodak 620 Films, gives 2 1/4 x 3 1/4 black-and-white snaps, 2 3/8 x 4 3/8 Kodacolor Prints

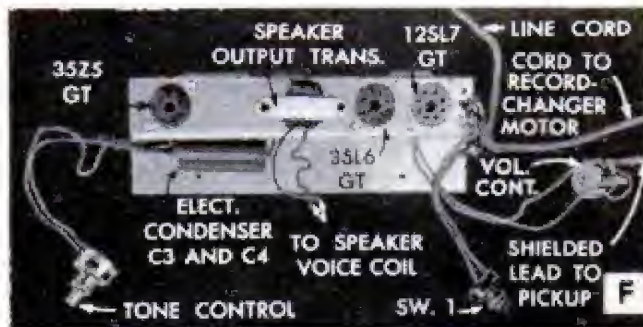


Kodak

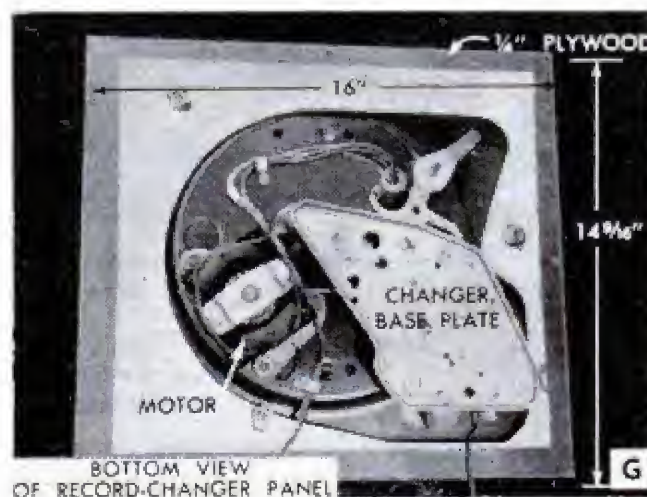
Portable 3-Tube Phono Player

(Continued from page 223)

Switch No. 1 is the master line switch on the control panel and switch No. 2 is on the automatic record changer. A complete



pictorial wiring diagram appears in Fig. 3. This shows an underside view of the sheet-metal chassis base. This metal base is made from either .010 or .020-gauge sheet aluminum easily bent to shape between two pieces of wood in a vise. All dimensions are given in Fig. 3. Photo C shows a top view of the chassis base which is bolted to the bottom of the case with the tubes facing the speaker, as indicated in photo E. Chassis photos C and F should be carefully observed as to the placement of the various parts, and construction should start with this amplifier chassis. Please note that leads for the controls should be long enough to reach the positions indicated on the amplifier control panel in photo E. Switch No. 1 can be either a rotary or toggle, s.p.s.t. type. The speaker is mounted



in the case by means of rosette-head ornamental antique-bronze machine screws and the output-transformer secondary leads are then connected to the speaker voice coil. After the controls are mounted on the control panel, cut a small notch, as indicated in photo E, to permit the a.c. line cord and plug to be brought out from the inside of the case when the lid is closed. The a.c. line connections are made on the

insulated terminal strip mounted on the chassis. These supply 110 volts for the changer motor which is controlled by switch No. 2. The power to the amplifier is controlled by master switch No. 1.

The shielded lead to the phono pickup must be carefully connected to volume control R1. The woven-wire shield is soldered to one outside terminal lug on the volume control and the insulated single-wire conductor is soldered to the other outside terminal lug. The 20-20 mfd. electrolytic filter condenser is mounted on the top of the metal chassis as shown in photo C. Be sure that the positive leads C3 and C4 are well insulated where they go through the hole in the chassis. Heavy spaghetti tubing may be used on each lead. The tube sockets should be mounted so that the center keys are in the positions shown in Fig. 3. Note that the common-ground connection for C5 is made to a soldering lug placed under one of the mounting screws that hold the output transformer on top of the chassis. Use rosin-core wire solder and No. 20 insulated hookup wire for the circuit. Make sure that all connections are both electrically and mechanically strong. Detailed student material list R-370 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.

Preamplifier for TV Signals

This 13-channel, self-powered television signal preamplifier has a pretuned selector system. It employs a nonoscillating circuit combination for easy matching of any antenna impedance to any TV receiver input impedance. It is



claimed to provide more gain in the antenna circuit, thus increasing the useful range of the receiver in fringe areas and other difficult receiving locations. A 12AT7 or 12AU7 tube is employed and a selenium rectifier is used in the B-supply. All channels are fixed and pretuned. The unit operates on the same 110-120-volt a.c. line as the TV receiver. Installed near the receiver, the connections are quite simple and instructions are supplied for either 300-ohm twin-line lead-in, or coaxial inputs. The case of the unit is insulated from the power source and a ground post is provided for use when coaxial cable connections are used.

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New Auto-Lite Spark Plug Has Built-in "Resistor" That Helps Deliver Smoother Idling, Better Radio Reception—Gives Improved Economy and Longer Electrode Life



Gives smoother engine idling

—because of the wider initial spark gap setting possible on the "Resistor" plugs. This assists in burning leaner mixtures, and reduces misfiring at idling and throughout the speed range.

Improves radio reception

—by suppressing spark plug interference with radio, radio-telephone, radar and television reception. (Under 35 mv/m from 540 kc. to 150 mc. at 50 ft.)

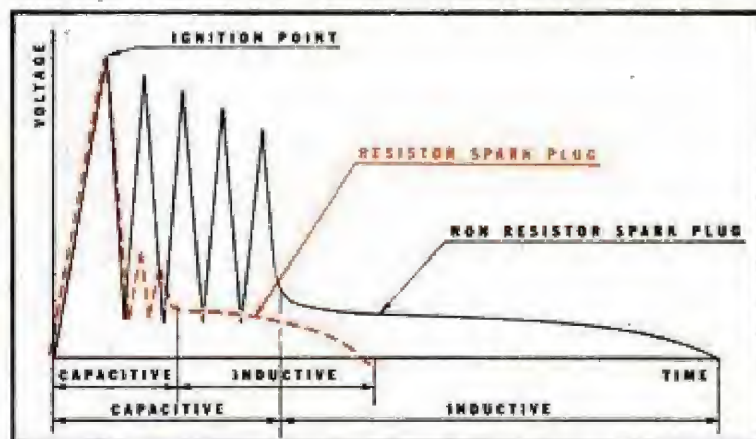


Reduces electrode gap growth

—by increasing electrode life up to 200% and more . . . due to the virtual elimination of the inductive component in the spark discharge.

• • •

AUTO-LITE Ignition Engineers, working with leading automotive manufacturers, have developed the new Auto-Lite "Resistor" Spark Plug with this built-in resistor for improved operation and economy. Regular type Auto-Lite Spark Plugs (patented U.S.A.) will continue to be manufactured.



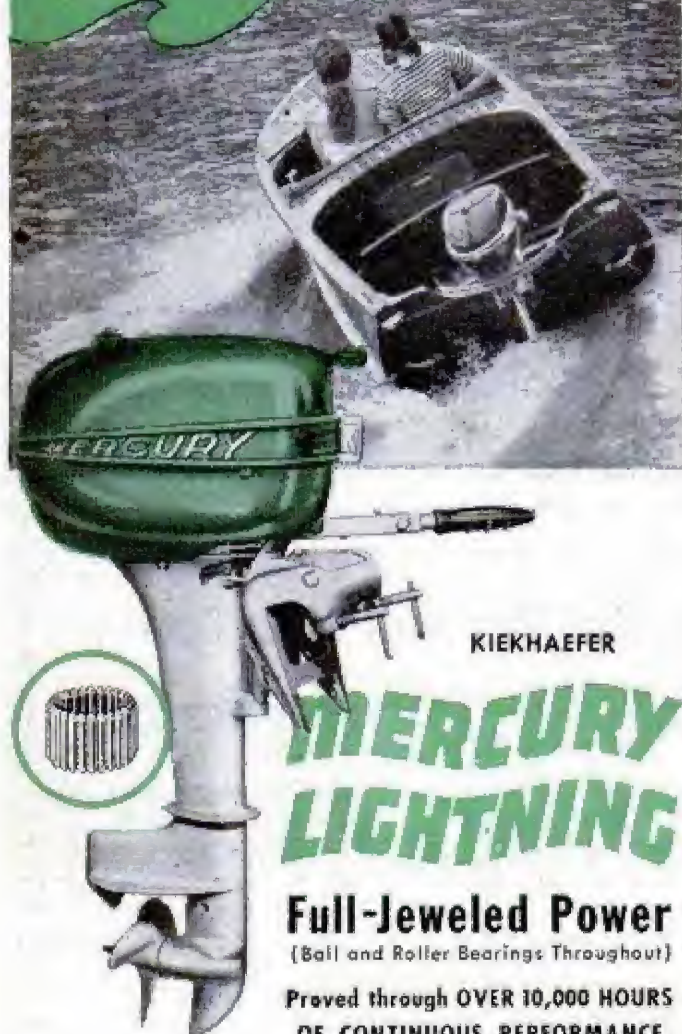
All spark plugs, including the new Auto-Lite Resistor Plug, ignite the fuel on the first peak of the capacitive component. However, the Resistor Plug dampens the remaining peaks so that radio, radar, and television interference is held to an acceptable level. Also, the Resistor virtually eliminates the inductive component that serves only to burn away the electrodes on ordinary plugs. The gap life is thus increased, making possible wider initial gap settings.

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NAME

ADDRESS

CITY.....STATE.....

How the War Came to Me in Tokyo

(Continued from page 99)

command the whole Navy, he should not stay behind the stage to save his life with his men at the dangerous front. Frankly speaking, I believe that he had no confidence in himself at that time to answer blind expectations of the nation to win the game with the declining navy forces. So he chose the final measure to adorn himself with glorious death as a brave soldier before the final dishonorable defeat came up. The death of the succeeding Admiral Koga aboard the boat shook the foundations of the nation's whole confidence. We should have terminated the war by this time, even upon unfavorable terms to us, if the people in the headquarters truly thought of the Emperor and his people. We relied too much upon the plausible tongue of the propagandizing of the government, but the poor nation could do nothing but doing so. To say anything unfavorable against the government or protest them meant lopping off his head by the force of Kempeitai, military police.

Since the beginning of the year 1945, the attack of superfortless planes B-29s was terrified day after day all over Japan. On one snowy morning in January a part of the most prosperous downtown in Tokyo was flattened in a few hours. The writer lost his elder sister with her five girls by the attack made soon after the above morning attack. I found that fact when her husband, a brother-in-law of the undersigned, called upon him next morning and inquired after her and her daughters. According to his explanations, the sound of an electric warning siren (SIREN) forced them to suspend their dinner. It was their last dinner. They dressed them up immediately for an emergency case, but the bombarding started too soon after the warning sound of the air-raid siren to give them the ample time for the preparation

(Continued to page 230)



**Model Builders
Attention!**

	V	V-2	V-3
Hex	1/2"	3/8"	5/16"
Thread	3/8"-24	1/4"-32	1/4"-32
Thread Length	7/32	7/32	9/32
Weight, Grams	8	3 1/2	2 1/2

Actual Size V-Plug

Champion Spark Plugs for model gas engines give the same dependable performance as regular Champions. Champion Ceramic insulation—Sillment sealed. Alloy needlepoint electrodes for easy starting. One piece construction.

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HOW TO TAKE BETTER TIME EXPOSURES

Paint out the dark spots with your flashlight

...it's a trick that every expert photographer knows and uses. Your stationary lights are fine—but, no matter how many you use, they may leave dark, shadowed areas that show up on your finished picture. Avoid these amateurish black-outs by moving your flashlight beam back and forth across the dark areas while you're making the exposure. Do it just as a painter would use a brush. And be sure to keep your flashlight powered with "Eveready" batteries. Powerful, dependable, they outlast all other brands.*



..... A little light on the subject of the dark room!


Here's where your flashlight's handy, too! Wrap 2 or 3 layers of dark green or red cellophane over your flashlight lens and you have a safe portable light to use in your dark room. It *won't* streak film and it *will* help you to locate objects and to operate conveniently.

*In general-purpose 4-ohm intermittent tests **THIS "EVEREADY" BATTERY** **OUTLASTS ALL OTHER BRANDS!**

Who thought up this test that takes the guesswork out of buying flashlight batteries? The American Standards Association, no less! ... And this is the test that *most closely approximates the average use* you give batteries in *your own flashlight*. Be bright tonight! Buy "Eveready"!

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Speed Sweep, the brush with the steel back, is designed to sweep cleaner, faster, easier, and to outlast ordinary brushes 3 to 1. Arbitrin sweeping fluid, sprayed on the floor before sweeping, disinfects, deodorizes, and removes stains in the process of sweeping. These, plus many more advantages (16 in all) have proved to be the perfect answer to effective, low cost floor sanitation in over 60,000 factories, offices, schools, and stores. Mail coupon for complete facts. *Milwaukee Dustless Brush Co., 530 N. 22nd St., Milwaukee 3, Wis.*

Milwaukee Dustless Brush Co.

530 North 22nd St • Milwaukee 3, Wis.

We are interested in complete information about Speed Sweep brushes and Arbitrin sweeping fluid.

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Address

CityZone.....State.....

of an emergency. What this means? Nothing but a poor functioning of Japanese Radars stationed at the defending line. They could, the people said, catch the attacking planes only when they were within short range of distance. This meant nothing valuable to the warning headquarters men with such high-speed planes as the superfortless. When the citizen heard of the warning silen, the attacking planes were already above Tokyo. It was ridiculous that we sometime heard the warning air-raid silen after the air-raid was started over us. If American could adapt rocket planes in this war, miserable devastation in the defeated land could have been saved, because it should have expedited the showdown of the struggle.

My brother-in-law told his wife to leave the house immediately, when the silen sounded, with five girls, the eldest one being 18 years old and the smallest five years old, for the place considered preliminarily safer. They did so with nothing on hand. It was the last departure in this life for his family. He stayed however in his house with his eldest son, 16 years old, to fight with the fire for protecting his house, but it was an useless effort. His house was flattened and ashed in less than an hour after the warning silen and when they tried to follow his wife after his house was burnt, the vicinity all around his house was completely entrapped by the fire. They could nothing to save their lives except to submerge themselves into the nearby river up to their necks, sometimes to dive into the water, to protect their eyes from flicking flame and dense smoke. It was nothing but a miracle that they survived until the next morning, under such dangerous condition, though severe scorches upon their faces. Many, many men and women died in a single night. He waited for the return of his family whole on the next day, but in vain. He waited, waited and waited for many, many days since then, but no response. I suppose that they lost their ways amidst the dense smoke and fainted and afterward entrapped by the terrific fire. Many factory buildings with steel skeleton of 10-inch I-beams were collapsed with the intense heat. How could human being resist it?

In this evening, I, with my wife and the eldest son, was watching the far reddened sky from my house, as the superfortless did not attack my residential district in this night. I had never expected death of my sister and lovely nieces in this night. I saw many, many B-29s flying over my head, reflecting their long silvery bodies

(Continued to page 236)

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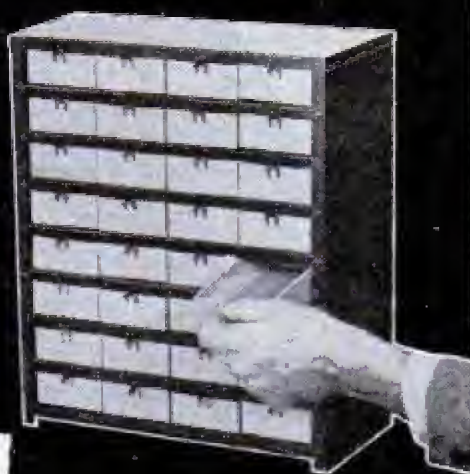
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Planing a Flat Side on Wooden Dowels

Q—I wish to flatten one side of a number of wooden dowels 3/8 in. in dia. and 10 in. long. The flat should be about 3/16 in. wide. I tried planing, but this was not satisfactory due to the difficulty of holding the dowel in a vise. Is there some way to do this easily?

R.M.—Lexington, Ky.

A—Use the modelmaker's trick of turning the plane upside down and locking it in the vise. Then simply draw the dowel across the cutting edge at a slight angle to give a shearing cut. Due to its long bed, a jointer plane gives best results.

Belt Squeal in Old-Type Refrigerator

Q—I have an older-type refrigerator with V-belt drive. Lately, at intervals, there is a loud squealing noise when the unit is running. There seems to be nothing wrong with the unit and motor bearings appear to have plenty of oil. What is causing this noise?

S.T.—Rochester, N.Y.



A—Belt squeal is the most likely cause of the noise you describe. After some years in service the sides of the V-belt wear smooth and there is a slight slippage as the belt passes around the small-dia. pulley on the motor. This defect will cause no actual harm. The simplest remedy for the annoying squeal is to touch both sides of the belt lightly with a cake of paraffin or a piece of candle when the unit is running. Repeating the application at regular intervals will prevent a recurrence of the noise.

Removing Oil from Rug

Q—Recently I spilled a small quantity of sewing-machine oil on my living-room rug. It spread and made a large stain about 8 or 10 in. in dia. How can I remove the stain without damaging the rug?

M.B.—Little Rock, Ark.

A—One method that has been used successfully is to place several layers of blotting paper over and under the stained area, then go over the blotters with a hot iron. Repeat the process with new blotters until most of the oil has been absorbed. Next, make a paste of fuller's earth or cornstarch and carbon tetrachloride. Spread the paste over the spot and allow to remain for 10 to

(Continued to page 234)

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12 hours, or overnight. Remove the dried paste and then beat white-soap shavings to a foam in water to which a small quantity of household ammonia has been added. Sponge the spot thoroughly with the foam, working outward from the center to prevent forming a ring. Use ammonia sparingly, not more than a teaspoonful to $\frac{1}{2}$ gal. of water, and less if the rug is of a dark color.

Paint Peels From Wide Cornice

Q—My home has wide, open cornices and paint will not stay on the underside of these cornices. It peels off within a year and exposes the bare wood. There are indications that previous owners have had the same trouble. What causes this and is there any simple and permanent way to remedy?

C.N.—Buffalo, N. Y.



A—Undue moisture plus a lack of air circulation are among the probable causes. The trouble is fairly common where a house of this particular type is in a more or less sheltered location with tall shrubbery and large trees close by. During the warm, humid days of summer, moisture tends to collect where there is insufficient air circulation and where the rate of evaporation is very slow. Expansion and contraction of the wood breaks up the paint film and dampness gets underneath. The best remedy is to rebuild the cornice to the more modern, narrow box type. The next best remedy is to scrape off all the loose paint, clear away any tall, dense shrubbery and overhanging tree limbs and allow the cornice to dry thoroughly. Then, when the wood is dry, apply a prepared undercoater cut to a fairly thin, watery consistency with a paint reducer. For such work some painters use a regular paint to which benzol has been added in the proportion of $\frac{1}{2}$ pint to the gallon. In either case, allow the first coat to dry at least three weeks. Then apply the second coat, brushing out to a thin uniform film. Benzol is used only in the first coat.

Cure for Damp Basement

Q—My basement is very damp during summer months, even when the weather is dry. Water collects on the floor at the base of the walls and drips from the water pipes. Clothing left in the basement becomes coated with a bluish mold. What can I do to eliminate the dampness in this basement?

T.R.—Lincoln, Neb.

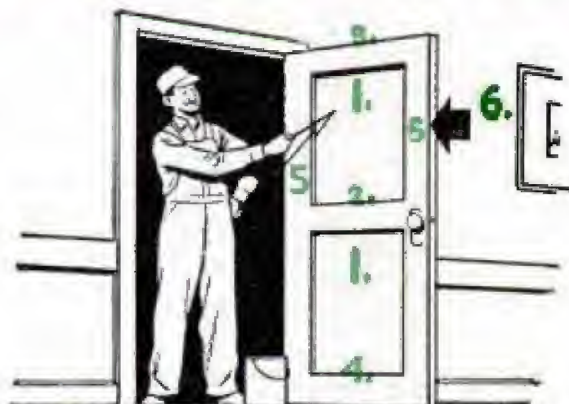


A—Your trouble is due to condensation of moisture on the walls and water pipes, the surfaces of which are colder than the air in the basement. Well-stocked hardware stores can supply a masticlike material for coating water pipes to prevent condensation. Chemicals are available which will help to reduce the moisture content of the air in the basement. These usually are placed in a cloth sack suspended in an open framework. Moisture collects on the cloth and drips into a container. Another method, probably the most effective, is the use of an exhaust ventilating fan mounted in a basement window. Capacity of the fan should be sufficient to completely change the air in the room at least once every hour. Operating the fan for an hour twice each day, once at midday and again in the late evening, should keep moisture condensation at a minimum. However, it sometimes will be found more effective to operate the fan only in the late evening. Open windows and move cabinets and other objects away from the walls so that air can circulate unimpeded.

HELPFUL POINTERS on house painting



When painting window frames, don't neglect chipped putty. Scrape out old putty down to the wood, coat with linseed oil and apply new putty. Let dry a day before painting.



When painting doors, follow this routine. Finish the panels first, the center rail next, then the top and bottom rails, and next the vertical stiles. Always do the edges last.



Use correct brushing technique. Apply half a dozen brushfuls at a time. Work *along* grain of wood and brush out thoroughly with long vigorous strokes. Then go over lightly to remove brush marks.



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by the searchlights of the defending army.

But the time had come at last to my turn. It was the night of April 13, 1945, that I lost the whole properties and hopes. It was a beautiful night with glittering stars above and no wind, but with a shining silver moon. It was an ideal night for an air-raiding. Immediately after I relaxed myself from the day's work in that night, I warned my family to prepare for the fighting, saying that "We should have an attack tonight," but nothing happened until 10:30 p.m. The radio broadcast amusement programs as usual until it was suddenly interrupted by the usual air-raid warning.

I switched off all lights; covered the radio set with a heavy blanket to prevent out-flowing of light, even of a pilot lamp. We sacked a little supply of emergency foods in a carrying sack. Deadly and dreadful calmness followed just as you usually experience before some big terrific thing happens. Thirty minutes later, characteristic humming of four engined planes enfolded us. Then, I felt shaking of my house by explosive bombs and incendiary bombs. We concealed ourselves in a large wardrobe closet when another shaking frightened us. Many things fell down upon the floor. The vicinity all around my house was brightened by the fire and incendiary bombs as if The Broadway was reproduced there. We heard cries of the people, noise of burning houses, and screaming of women for help.

I thought it danger to stay in the house any more, lest the house collapse over us. So we dashed into the garden to protect ourselves in the preconstructed sheltering cave in the ground, having 5-inch square lumber atop. My experience shows that this is the worst place in the world to protect us in such a case. It is the most dangerous place.

I believe that I should have stayed in the house because even the Japanese house is safer and stronger than a shabby underground sheltering pit, against the incendiary bombs. In case the explosive bomb hits right upon its objective it makes no difference whether we stay in the house or in the underground sheltering place. It is the final and fatal.

Soon after I dashed out of my house, an incendiary bomb was dropped at one corner of the house, but it penetrated roof and ceiling only at an angle and pierced into the earth without burning my house. Another incendiary bomb hit my underground pit a few seconds after I and my family entered it. I should have been killed there with my wife and son, had it not

(Continued to page 238)

**"That hammer?
You're kidding!"**



FRED: It's a fact, Bill. I've been using this same hammer for 29 years. It helped to build the house you were born in.

BILL: Well, I don't know how you do it. I hardly ever *use* a hammer, and yet I've broken two of them in the last year or so.

FRED: That so? What kind of hammers were they? What brand, I mean.

BILL: Gosh, I don't know. Guess they didn't have any brand names. But they were good bargains.

FRED: That's where the trouble is, Bill. Look . . . see the name on this hammer? Whenever you see that brand name, you

know it's a good hammer. Stick to the well-known, advertised brands when you buy tools, and in the long run you'll save a lot of money.

BILL: That makes sense, Fred. I'll remember it.

FRED: And do your buying at the hardware store, where they don't try to sell you anything but quality tools. That way you'll always get your money's worth.

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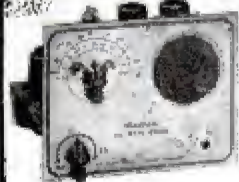
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5-inch square protecting lumbers above the pit. The bomb must have been dropped from some altitude, but it could not penetrate 5-inch lumber and rebounded, leaving 1 1/2 inch deep burnt cave in it. However, its heavy shock loosened earth and lumber members and we were entrapped in it. We could not stand up in it with heavy pressure above. We tried to get out of it, but could only do that with blood and hurt on our faces and hands. When we got into the open space, we were terrified to see the dreadful scene outside.

Stars were glittering above as if they did have no concern with human conflict down below. Oil scattered from incendiary bombs were burning on the ground; above fences; on the branches of trees; and above roof of houses, as if thousands of small Christmas candles were lighted up all one time for devil's sake. I could not walk without trodding over them, as such devil candles were burning every one square foot of the area. In the high air, when a master set of the incendiary bomb disassembles to scatter its baby incendiary bombs length and width of the area, it flashed a beautiful illumination just like a festival display of fireworks. We could see many, many of them in the air. Soon they hit objectives down below and burnt everything contacted.

We could only see in the sky B-29s, but none of our night fighters to defend Tokyo. Occasional explosions of our guns resounded unanxious echoes. I thought that everything came up to the last moment. So I gave up my efforts to quench the fire of my house and resolved to get out of the place. I cried for my wife and boy, but in vain. We could see none of our neighbors.

I cried, cried and cried for them, but no response at all whatsoever. So I decided to go back into the burning pit again, risking my life, to catch them; though it was very, very dangerous to do so. The burning houses and trees hampered me to go back to the space easily. I could not reach the spot without going over the burning lumbers scattered upon the ground. My shoe-strings were cut by the burning fire. My shoes were about to crack, but I dashed to the spot. Nobody was around there by that time. I forced myself into the underground pit again, but to my disappointment, at the same time to my joy, none was there.

When I crawled out of the pit again, the situation was found to be more terrific than before. The road was completely covered with burning material. The burning houses were falling down on the road. I thought my wife and son were dead, but

(Continued to page 240)

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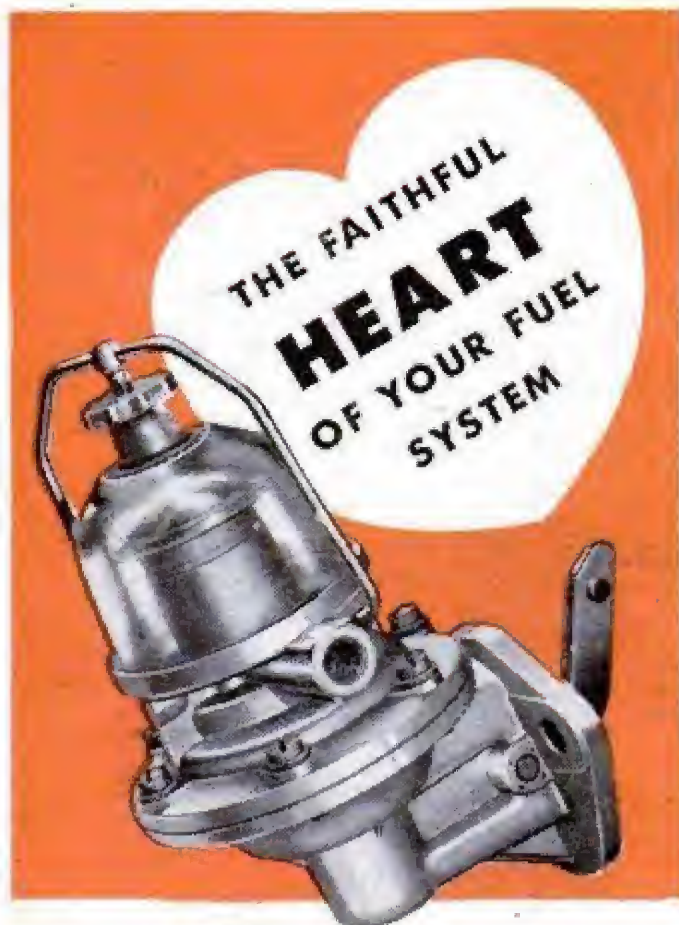
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was fortunate to find my wife screaming for me about 100 meters ahead. You cannot imagine how I was delighted to see her, but my son was still missing. We tried to find him again and again, but the situation did not allow me to stay there any longer. If we stayed, we would have been entrapped with dense smoke, terrific heat and flame. We had to abandon him.

We however could not leave that spot without knowing anything about him. I made up my mind to force my wife to leave the spot with me, but she resisted. She was not crying. She was calling the name of our son for her life as if she was not aware of anything dangerous around her. We then heard the far crying voice of our son calling his mother. I could not believe it. Fire was crazing around us and we were amidst the horrible flame and heat, but we found him there. He said that he had once left the spot with his friend, but, shocked with a thought of his parents, he dashed back into the fire again to search for us.

It was a fine spring morning next day. I lost everything I had, except a small daily-life necessary things stored underground place. I will (not) cry over spilt milk. Another day for another dollar. What we have done is what we have done. This was the morning of April 14, 1945. Nobody knew that American Marine floated, over Iwo Jima, atop Mount Suribachi, at 10:20 a.m. of February 23, 1945, the Stars and Stripes. We should have abandoned the war by this time if we had a foresight.

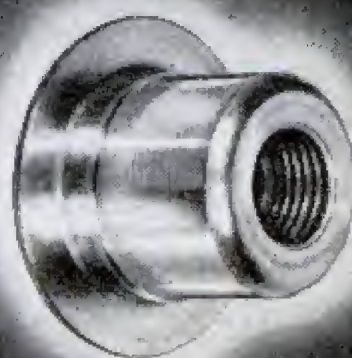
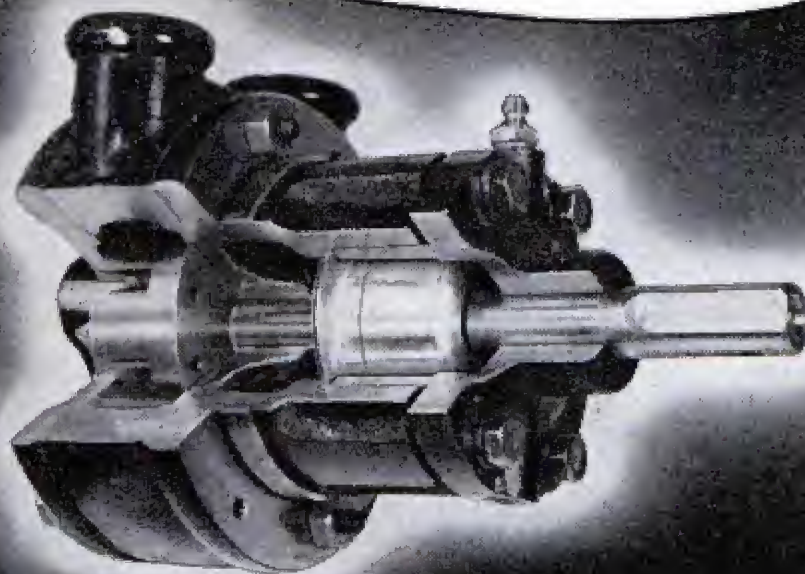
We stayed in Tokyo until June 8, 1945 without doing anything, but left Tokyo for Fukushima, 100 miles from the capital. Tokyo was attacked by B-29s day and night during these days and we all gave up hope for our lives. Tokyo was assaulted by hundreds of small carrier planes in daylight time. It meant that all of Japanese war ships had been destroyed and that we had nothing to defeat the enemy's carrier boats. The battle was nearing its final, but military clique was still insisting continuing the war to the last point. Poor Japanese nation.

When I was in Fukushima, everything was peaceful at the beginning, but it was soon changed into a battle. In one night, we awoke to hear terrible thunder and shaking of the ground. My house was standing amidst green rice fields and there was nothing worldly things around us. When I was awoken suddenly by the thunder, I immediately opened the door and dashed outside to find out what was going on. Several streaks of glittering lightning

(Continued to page 242)

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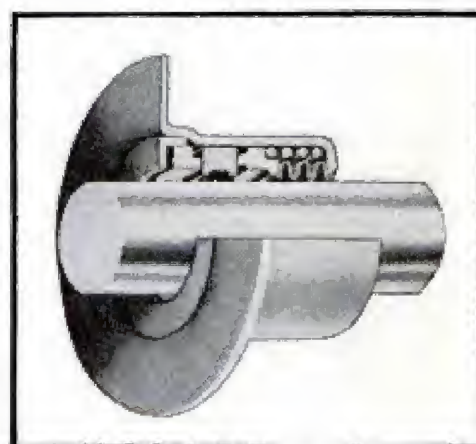
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occasionally flashed from the far distant mountains up into the rice fields around my house, accompanied by thunder. It was an attacking by guns of War Vessels. I thought that I finally came up to the point wherein I had to breathe my last life. You cannot imagine how terrible it was. A half hour seemed to me as if one week at that time. A few days later, village folks told me that Hidachi Airplane Factory was assaulted by American War Boat from off the shore, 20 miles apart.

In concluding, I wish to tell you that we Japanese people keep in our minds heart felt thanks for your nation-wide assistances given to us after the termination of the war. I sometime see articles saying that the present attitudes of Japanese people for DEMOCRACY is superficial, external and cannot be relied, but I strongly protest. I can tell you with confidence that the majority of Japanese people are eagerly contriving to achieve the real democracy. We are combating now with the vicious and aggradizing inflation and with delinquency of morals, but the future of Japan is bright. We will be one of the best peace-loving and cultured nations in the world. We hate the war.

Slag Used to be Useless

(Continued from page 117)

make lightweight concrete without sand or other materials. It is chemically inert and has no corrosive effect on structural or reinforcing steel, plaster or paint.

These lightweight building blocks have an advantage over ordinary concrete blocks in that wood can be nailed directly to them without the use of nailing plugs or strips. The cellular characteristic of slag gives them a high sound-insulating efficiency when plastered, and sound-absorptive ability when left exposed.

Among the large structures built of slag-concrete blocks are the Trinity Church and the new armory in Chicago and the Porter Memorial Hospital in Valparaiso, Ind. It is becoming more and more popular for building small homes and its insulating qualities cut down heating costs in northern sections.

Towering piles of once worthless slag are now looked upon as industrial gold mines by the men who buy and process it into building materials that make for more comfortable living.

☐ Insects cause an annual crop loss in this country of approximately four billion dollars, according to figures from the Department of Agriculture.



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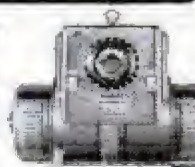
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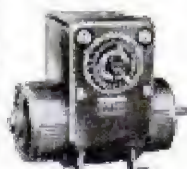
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Inventions Screened Here

(Continued from page 133)

Also under development is a brush-pulling attachment for use with a tractor. An efficient machine for pulling brush is badly needed in the Southwest where millions of acres of ground are covered with dense mesquite brush that chokes off the grass. Before cattle can graze properly or before the ground can be used for agriculture the mesquite must be removed. Usually a bulldozer is used to tear down the brush, but this is expensive and the mesquite often grows back in a season or two.

The institute's brush puller actually jacks each bush or small tree right up out of the ground, removing enough of the root system to prevent regrowth. The machine grips any tree up to eight inches in diameter and has an upward stroke of 40 inches, after which it can take a fresh grip if another lift is required. Hydraulic cylinders provide 40,000 pounds of pressure to the jacking device.

Some of these ideas were originated by staff members, some are developments of inventions submitted by individuals. Submission of an invention to the institute should be done by mail whether or not a patent already has been applied for. If no patent papers are available, the institute suggests that the inventor submit a simple sketch that shows the working parts of the device, a written description of how it works and what it will do, and the signature of the inventor, witnessed and dated by two persons not related to him.

Mere suggestions are practically worthless; the institute is interested only in concrete workable ideas that are new and useful. A staff of experts evaluates the material that is submitted, selects ideas that appear to be suitable for development by the institute, and works out suitable contracts with the inventors. The organization does not engage in financing, promotion, or manufacture. It merely brings a selected invention to the marketable stage and then seeks a manufacturer for it. If the institute drops a project, it turns back all rights to the original inventor, including any work it has done on the idea and any patents that have been issued, without cost and without any strings attached.

The Institute of Inventive Research has been busy during its short life and so has its companion, the Southwest Research Institute. One job this organization did for a client was to develop a coin-operated bottle opener for attachment to the side of a soft-drink refrigerator.

Instead of using an expensive soft-drink

(Continued to page 246)

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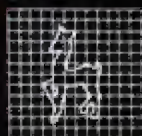
2. SAW AROUND GIRL



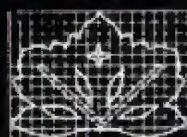
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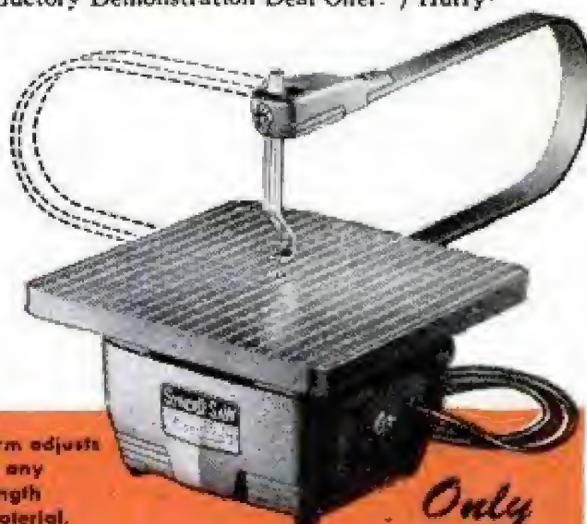
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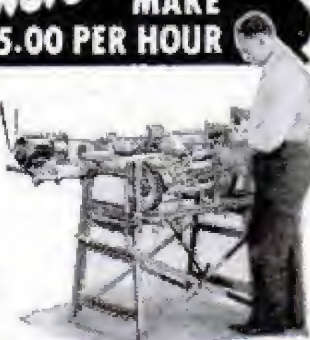
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dispenser that is coin-operated and holds only one brand of refreshment, many gas stations and stores place their soft drinks in an unlocked icebox. Customers help themselves and a forgetful one sometimes neglects to pay for his drink. The coin-operated bottle opener takes care of this automatically. The customer picks up his cold drink and then places a coin in the opener device. The coin allows the blade to slide down into place where it remains until a bottle has been inserted and the cap has been removed; then the blade is retracted until another coin is deposited in the opener.

Southwest Institute did some of the work in developing vacuum pads that are placed on fresh concrete in order to dry the concrete to 24-hour strength in a quarter of an hour, allowing the finish coat to be put on without delay. It worked out a design for stressing sheet aluminum for use in building construction, and it perfected an air-flow meter for use in calibrating the blowers used for cooling refrigerated meat shelves and other refrigerated storage compartments.

At present it is working on a vacuum-tube ignition system for internal-combustion engines that would replace the present ignition system and is developing an automatic cooker for corn chips, a food snack manufactured in the Southwest.

Meanwhile the third member of the research trio, the Foundation of Applied Research, is busy on problems of its own. It is seeking to reduce the present lengthy periods of experiments through which allergy patients must proceed in finding the remedy for their affliction and it is following up a lead in cancer research, using a self-sustaining artificial heart, that holds promise of interesting developments.

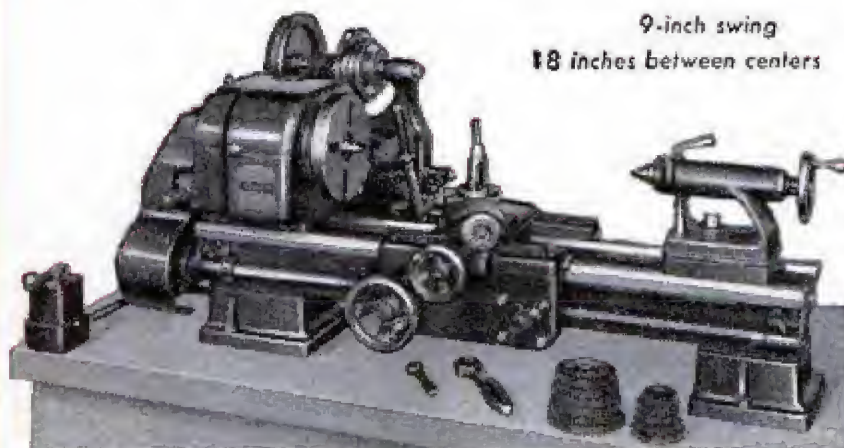
Considerable research has been done for the petroleum industry. One of the present projects concerns the possibility of mapping underground structures by the reflected seismic waves of explosions that are set off at the surface. At present it is necessary to drill holes as deep as 300 feet and explode the charges at the bottoms of the holes. The new idea would make use of the directional force of the so-called shaped charges that were perfected during the war. If successful, the method will materially cut the present costs of geophysical surveying.

Rich for decades in cattle, oil and agriculture, the vast Southwest has been growing rich in industry as well in the last few years. Tom Slick's three research organizations already are solving some of industry's problems. They fill a regional need that was becoming acute.

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Spying on Mars by Invisible Light

(Continued from page 154)

shield, but Kuiper found no trace of it. "There may still be another substance in the Mars atmosphere, as yet unidentified, able to reduce the ultraviolet radiations," he states. "But it may be that living organisms on Mars have developed a protective layer comparable to a strong sun tan so that the ultraviolet radiations are not harmful to them any longer."

Any animal life on the planet may have perished long ago, unable to adapt itself to the rigorous conditions that prevail there now. If an intelligent race still persists the assumption is that its members would spend most of their time underground, insulated against ultraviolet radiations and low temperatures and where oxygen and water could be conserved.

The reason why there is so much speculation about intelligent life on Mars is that various astronomers have observed long, straight, canal-like markings that crisscross the arid plateaus. Some of the lines are parallel and close together, some cross others at spots that spread out like oases. Thousands of miles long, the straight lines must be artificial. No such instances of patterns of straight lines are known in nature. The lunar cracks, for instance, are not at all comparable.

A plausible suggestion is that these lines are waterways built by the Martians in a desperate attempt to prolong their existence when the planet was drying up. The dark color of the lines suggests that vegetation continues to grow in them even though water no longer can be observed.

Other astronomers have been unable to spot these canals and suggest that they are simply an optical illusion that comes from a too-intense concentration of vision. Possibly, they say, the lines are simply an unconscious joining together of dark spots that are at the limit of visibility.

The turbulence and shimmer of our own atmosphere make the dispute difficult to settle. Only for a few seconds at a time, from any point on earth, is the atmosphere sufficiently at rest to permit the "super seeing" that astronomers desire. These periods may total only an hour a year.

Dr. Edison Pettit of the Mount Wilson Observatory viewed Mars during one of these periods and he was astonished to see the canals come into view, though previously he had doubted their existence.

"I was studying the equatorial markings of the planet when suddenly a canal appeared to descend from the equator to the

(Continued to page 250)



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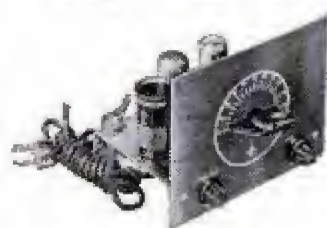
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lower polar cap, wriggling as it descended and then becoming steady," Doctor Pettit reports. "Almost simultaneously another north-south line appeared and within a few seconds a third was observed. They seemed to fade in and out. An hour later a fourth canal could be seen and for short periods all four were visible."

For several nights, both with a six-inch refractor telescope and a 20-inch reflector, Pettit continued his observations, mapping the canals as new ones appeared due to the rotation of the planet. He deliberately refrained from studying drawings made by other observers and not until his observations were completed did he compare his drawings with theirs. The agreement was surprising.

Mars will be in opposition (closest) to the earth in the spring of 1952 and again in 1954, after which astronomers will have to wait 15 years for another close view. For the last few decades astronomers have spent most of their time reaching as far out into space as their instruments would permit, learning more about objects that are millions of light-years away. Routine observations of the planets have been left for the most part to amateur astronomers. Today, however, there is an increasing inclination by astronomical science to review our own planetary system once more and to check up on the work that was done on nearby objects as much as 50 years ago.

Mars is of major interest in this program and it is anticipated that the world's leading observatories will train their telescopes on the planet during the oppositions of 1952 and 1954. With luck and with the right photographic equipment, sharp, clear photographs of Mars may be obtained. If the photographs reveal no canals, it will be necessary to re-examine the entire canal theory. If, on the other hand, the presence of canals is confirmed, science will have evidence that the earth is not the only planet on which higher forms of life have occurred.

Portable Bowl for the Midgets

(Continued from page 94)

owns the Giants baseball team, and proposed that he rent the Polo Grounds for racing, the baseball magnate had grave misgivings. He insisted that the track be designed so that it would not damage the turf and that it must be erected immediately before and taken down immediately after every semiweekly program so that the grass on the field would receive sun

(Continued to page 252)

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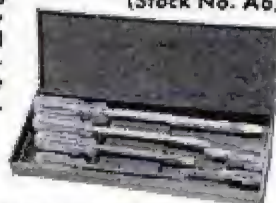
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Consists of leatherette tool roll, 1 break and shock-proof plastic handle, and 5 interchangeable oil tempered, chrome vanadium steel blades: $\frac{1}{8}$ ", $\frac{3}{16}$ ", and $\frac{1}{4}$ " regular; No. 1 and No. 2 Phillips. Fits easily into back pocket. An ideal all-purpose screw driver kit. Fully Guaranteed. Price, only . . . \$2.50

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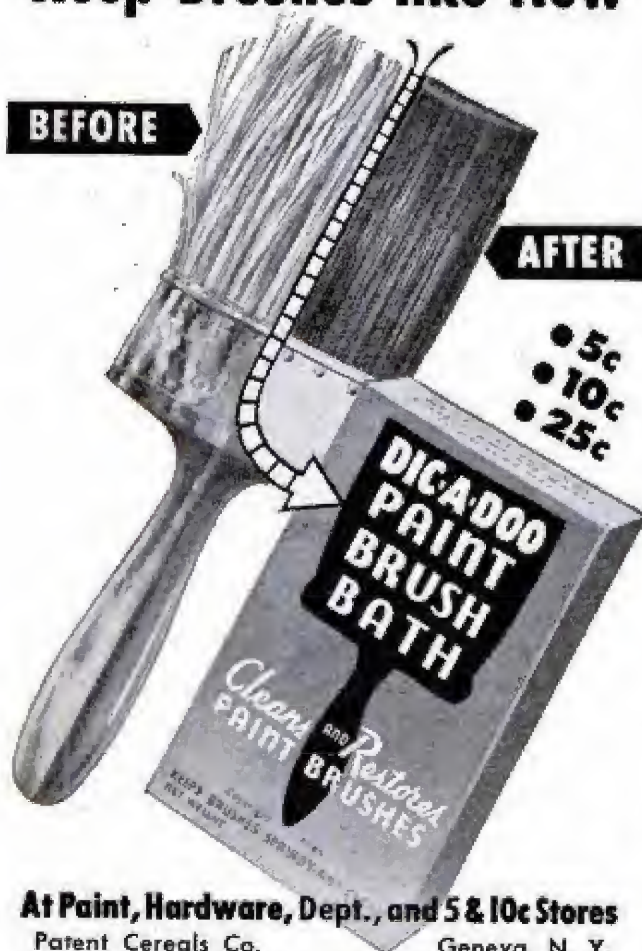
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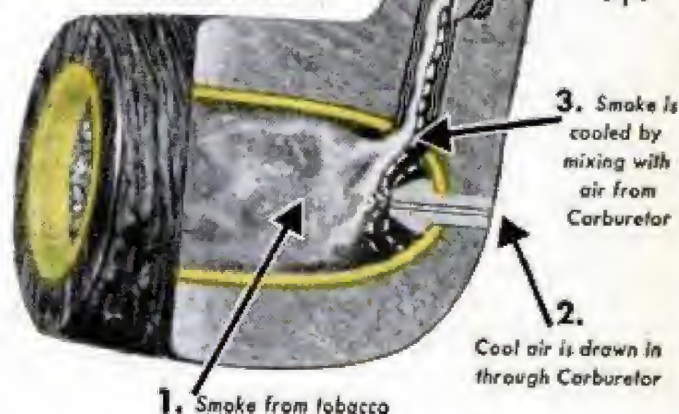
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Honey-treated



For the man with a
sensitive tongue
CARBURETOR
cools your smoke,
makes it mild

\$2.50



1. Smoke from tobacco

2. Cool air is drawn in
through Carburetor

3. Smoke is
cooled by
mixing with
air from
Carburetor

Cool air drawn through the patented* Carburetor keeps the bottom of the bowl dry, so there is never a "wet heel". Bowl is treated with honey, so no "breaking-in" is required. A pipe that beginners can enjoy without having to accustom themselves to it. Ask for Carburetor Yello-Bole at dealers, \$2.50. Kaufmann Bros. & Bondy, Inc., Estab. 1851, 630 Fifth Avenue, New York 20.

*U. S. PAT. NO. 2,082,106



This picture of
Honey Girl is
displayed
wherever Yello-
Boles are sold.



Identify Yello-Bole
pipes by the honey-
seal in the bowl. It
keeps the honey fresh.

NEW FOREDOM Model #99

at an **Amazing LOW PRICE**

FLEXIBLE SHAFT MACHINE

with **PENCIL-SIZE HANDPIECE**

\$15⁹⁵

COMPLETE WITH MOTOR



**Grinds, Polishes, Cleans
Sharpens, Mills, Carves
Engraves, Etches on Metal
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5 REASONS WHY FOREDOMS ARE TOPS:

1. Extra power and longer motor life because motor not dwarfed to fit hand.
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3. No obstructed view of your work.
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Foredoms handle hundreds of tasks. Use them for pleasure or profit, for tinkering or expert craftsmanship. Their versatility is unlimited. Use them to grind, polish, mill, engrave, sharpen, slot, rout, saw, carve, clean, sand, etch, cut, etc. Ideal for internal carving of plastics, the astounding new craft. You can work on wood, glass, plastic and all metals with a Foredom. No. 25 Accessory Set (A truly versatile assortment) only \$5.50 extra.



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Specify motor shaft diameter ☐ I will pay postman.

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PLAN SET No 16



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and rain. Thompson himself wanted a well-banked oval to insure fast times and one which was sufficiently rugged that it wouldn't come apart under the terrific centrifugal force of a dozen cars hitting one of the banked turns at better than a mile a minute.

The Levys designed a track so simple that it can be erected or dismantled without any tools by a crew of 200 men in 15 hours or less. The foundation consists of a series of aluminum trusses, some as long as 24 feet, but all so light they can easily be carried by two men. Metal thickness is 1/4 inch and the top and bottom members are Ts. The supports within the trusses are riveted.

The track is 36 feet wide on the straightaways and 44 feet on the turns. It has a 12-foot apron next to the infield for warm-ups and disabled cars. Three trusses extend from the inner edge of the apron to the outer rail where they are braced with aluminum cross stays. The fasteners by which trusses are secured to the vertical members are made of stainless steel.

The racing surface consists of one to four-inch pine boards, which give excellent traction and absorb oil. These are assembled into units of four or five boards, either straight or curved to the radii of the turns. The boards slip together by tongue and groove and are secured by wood and aluminum cleats on the underside. The board units are grooved on the underside and are slipped over Ts on the top sections of the trusses.

The units are numbered to show their location on the track. This feature, plus the put-it-together-with-your-bare-hands aspect, make assembly, disassembly and reassembly as simple as working with a child's building set.

All the components of the track fit with extremely fine tolerances to assure the necessary rigidity. An observer standing beneath a turn cannot see the slightest sway when a dozen cars roar over his head at about 80 miles an hour with 48 tires doing their level best to push the corner out of the mobile track.

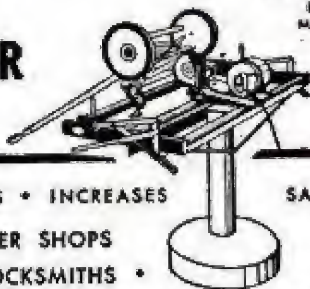
The track is 500 feet long, 230 feet wide, consists of 2200 sections, weighs 650,000 pounds and cost \$150,000. So evenly distributed are the 325 tons that the ball-park turf is unmarred.

While the weight is substantial, the entire track could be transported from city to city in 30-odd big trailer trucks, making it possible to bring the thrills of midget racing to any city or town that boasts a full-size baseball park. The track is scheduled for use in California this winter.

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THE MODERN LAWN MOWER SHARPENER

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No Extra Attachments Needed*

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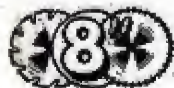


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UNCONDITIONALLY GUARANTEED ONE YEAR

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GROBAN'S SURPLUS BARGAINS!

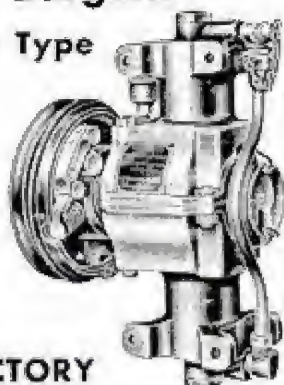
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War Surplus Bargain**

2-Cylinder Piston Type

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Designed for automotive truck or tractor mounting. Can be run off fan belt or power takeoff. Comes with automatic clutch. Can be installed for use on: farm trucks, jeeps, tractors, tire or garage service trucks, contractor or road building machinery, pneumatic devices, etc. Has 2 inch bore — 1½ inch stroke.

Can be operated with ½ H.P. or more electric motor or equivalent portable gas engine.

Light weight, compact and versatile unit... delivers "oil free air"... simple in operation; requires minimum of maintenance; operates under all climatic conditions; suggested operating pressure 75 P.S.I.; equally efficient operation in either direction of rotation; approx. displacement 3.27 CFM at 600 RPM, 6.54 CFM displacement at 1200 RPM; Overall dimensions: width 9", height 11½", depth 6½"; approx. wt. 23 lbs.

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5/16" letters, 2½" length, can be used hot or cold—ideal for stamping or burning lettering on leather, wood, plastic and soft metals such as aluminum, lead, copper, brass, etc. Complete alphabet, numbers and punctuation. Available in veneer fitted case. Excellent for marking, identifying and stamping. Worth many times this unsurpassed price of

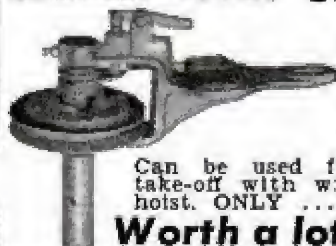
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Can be used for power take-off with winch and hoist. **ONLY**

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Chicago

GROBAN SUPPLY CO.

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Mass Attack on Heart Disease

(Continued from page 85)

blood as a fatty substance, and in some types of fatty foods including butter, milk and egg yolk. Many doctors believe that this substance may cause hardening of the arteries. That's the reason so many middle-aged men are advised to cut down their intake of butter. Doctor Keys hopes to find out the exact influence of cholesterol on the arteries. His opinion at present is that the substance has much less effect than previously supposed.

Not only physical but mental and emotional tests are given the volunteers. They fill out a 500-question form, which gives the psychiatrists associated with the program a picture of their personalities and the emotional strains and tensions under which they live. Every person has "regulating machinery." Under excitement, this machinery prepares him for quick action by pumping more blood through his veins and boosting his blood pressure. The trouble is that no one can voluntarily control this machinery, and under certain circumstances it is so unstable that it may overact to shove a person dangerously close to a heart attack. The psychiatrists who work on the project are attempting to find out how the volunteers are likely to react to emotional excitement.

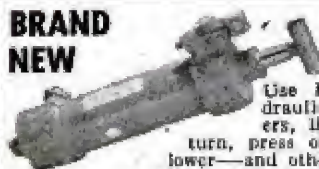
All 500 volunteers have been given their first-year's examination, and soon will report for their second. At the outset every one of the 500 was believed to be in good health and free from significant diseases of the heart and arteries. The first-year's special tests, however, showed that many of the volunteers were less healthy than they supposed. Of the 300 men in the prime-of-life group, nine were so abnormal they had to be dropped. Ninety others had already developed heart trouble of some kind. Fifteen men had stomach ulcers and several others had diabetes and thyroid disease. Most of these men thought they were in perfect health.

Because it's a long-term project, Doctor Keys will not predict the results as yet. In his opinion, though, the three most important factors in heart disease are obesity, exercise and emotion. A person who is fat seems to be more likely to be attacked.

"The big job is to find out how diet, physical activity and emotion predispose a person toward heart disease," says Doctor Keys. "As these 500 men are studied year after year the characteristics that precede heart disease should become evident. When we have that knowledge we shall be able to devise preventive hygiene."

GROBAN'S SURPLUS BARGAINS!

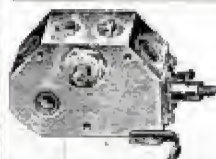
BRAND NEW



AIR OR OIL HYDRAULICS

Use hydraulics on arbor presses, hydraulic presses, hay lifts, manure loaders, lift trucks—push or pull, lift or turn, press or squeeze, open or close, lift or lower—and other hydraulic and industrial applications. Use with either air or oil . . . of finest precision workmanship.

1. Use these cylinders on farm trucks, bulldozers, hay lifts, manure loaders, etc. Double action, 1 1/2" bore, 27" stroke. (Will lift 1700 lbs. in 2 seconds with Vickers Pump). A \$55.00 value for only . . . **\$12.95** postpaid
2. Double action, 2 3/4" bore, 8" stroke. (Will lift 4400 lbs. in one second with Vickers Pump). Will withstand 1500 P.S.I. against wall. A \$65.00 value, available now at . . . **\$14.50** postpaid
3. Double action, 3" bore, 12" stroke. All steel hydraulic cylinder, will lift up to 12,000 lbs. (7000 lbs. in 3 seconds with Vickers Pump). A \$78.00 value. Wt. 12 lbs. . . . **\$19.50** postpaid
4. Double action, 3 1/2" bore, 11" stroke, will lift 9000 lbs. in 7 seconds using Vickers MF6 Pump. A \$92.00 value. Wt. 15 lbs. . . . **\$22.50** postpaid



Brand New Hydraulic Control Valves

Outlets are standard 1/2" pipe thread and inlet takes standard 1/2" copper tubing fitting.

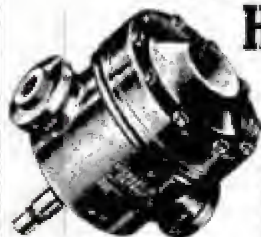
1. Four-way control valve for use with 1" double action hydraulic cylinder, may be used with 1500 P.S.I. hydraulic system. Brand new. Ship. **\$7.95** wt. 4 lbs. A \$38.00 value. . . . postpaid
2. Four-way control valve for use with two hydraulic double action cylinders. Each cylinder may be operated independently of the other or in conjunction with the other. Oil may be locked in any of the cylinders to hold the piston at any required position. Brand New. Ship. **\$10.95** wt. 6 lbs. A \$60.00 value. postpaid
3. Same as valve item 2, except that unit is designed for three double action cylinders. Brand New. Ship. **\$12.95** wt. 8 lbs. A \$72.00 value. . . . postpaid
4. A two cylinder double action valve with a unique arrangement, allowing the operator to raise both cylinders simultaneously, to lower them simultaneously, or to raise one and lower the other at any predetermined rate and speed. Brand **\$14.95** New. Ship. Wt. 8 lbs. A \$75.00 value. . . . postpaid

VICKERS MF6 HYDRAULIC PUMP OR MOTOR

Compact, powerful, rated 1,000 P.S.I., .507 cu. in. per revolution, 8 gal. per min. at 3750 r.p.m. Change rotation by reversing flow. Delivers up to 6 H.P. BRAND NEW. Wt. 4 1/2 lbs., \$60.00 value for . . . **\$14.95** Postpaid



VICKERS HEAVY DUTY HYDRAULIC PUMP BRAND NEW



For tractors, bull-dozers, construction machinery, lift trucks, industrial applications, etc. Delivers 18 gal. per minute at 1000 P.S.I. at 1200 R.P.M. using 10 H.P. Has 1 1/2" intake; 1 1/4" outlet; threaded and keyed 3/4" shaft for direct or pulley drive. Wt. 40 lbs. Dimensions: 5 3/4" diameter, 7 1/2" high. Original value \$148.00. NOW . . . **\$39.50** F.O.B. Chicago

ELECTRIC PUMP

Compact — BRAND NEW

Applications: oil burners, aquariums, fluid metering, fuel pump, tool post grinder, coolant pump, pressure lubricating pump, general industrial, etc.

Motor mfd. by Black & Decker; double ball bearing series wound, continuous duty, 1/30 H.P. electric motor, rated 12,000 R.P.M. Transformer included for use on 110 VAC current. Also applicable for 24-32 VDC.

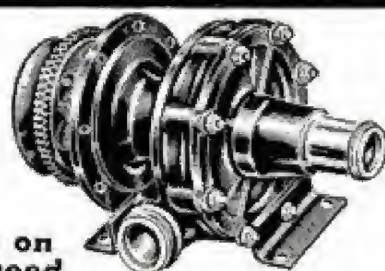
Pump mfd. by Weldon Tool Co. with standard 1/2" tubing ports; rated 2 G.P.H.; remove pump and use motor as high speed grinder.

Overall dimensions: 7 3/4" long x 3 1/4" high. Approx. wt. 5 lbs. \$51.00 value. . . . **\$12.95** postpaid



BRAND NEW ALL-PURPOSE WATER PUMP

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Use it for:
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Complete with pulley and mounting brackets, ready for use.

Belt Driven — Centrifugal Pump

An extraordinary value for all types of intermittent or continuous pumping in the home . . . farm . . . factory. Built to exact specifications of Packard Motor Car Co. for use in Rolls-Royce Merlin Aircraft Engines. May be two with electric motor, gas engine or power take-off on tractor. Delivers up to 25 gallons a minute with 1/4 H.P. motor; 80 gal. a min. with one H.P. motor. Will deliver up to 44 ft. head or 25 ft. suction. Use 1" outlet hose; 1" or 1 1/2" inlet hose (recommended).

COMPLETE ENGINEERING REPORTS AND OPERATING INSTRUCTIONS FREE WITH PUMP

Has cast aluminum housing, accurately machined 5" bronze impeller; 3 1/2" V belt pulley and mounting brackets. Shaft rotates on ball bearing; has grease gun fitting.

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\$21.50

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VACUUM-AIR HYDRAULIC GENERAL PURPOSE PUMP

Original Cost

\$45.00

Now Only

\$9.95

Prepaid in U.S.A.

Use them for OIL BURNERS

SPRAYING MACHINES

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HYDRAULIC SYSTEMS

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Worth Many Times This Low Sale Price

● Originally cost \$45.00. May be used as air or fluid pump—for pressure or vacuum. Standard 3/4 inch pipe thread with interchangeable ports. Will pump 7 1/2 gal. SAE 30 oil per minute at 300 RPM. Builds air pressure of 30 lbs. per sq. in. at 1000 RPM. Vacuum will draw 26 inches of mercury at 1750 RPM. Develops up to 120 lbs. per sq. inch of hydraulic pressure, which in conjunction with a 3 inch hydraulic cylinder will lift 840 lbs. minimum. Runs forward or reverse. Self aligning shaft. Die cast aluminum housing 6x4x4 inches. Has stainless alloy steel vanes and impeller. Made by Bendix Avia, Corp. Spline terminal for direct drive—readily replaced with a pulley. Recommend a 1/4 H.P., or stronger electric motor. Rated capacity 1500 RPM with high overload factor. Special price for quantity users. Complete illustrated engineering report and instruction booklet FREE with every pump. Send check or money order today! Postpaid in U.S.A. **\$9.95**

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ARCHITECTS! DRAFTSMEN! ENGINEERS! STUDENTS! YOU NEED THESE C-Thru TIME SAVERS...

C-Thru ADJUSTABLE TRIANGLE... ONLY \$4⁰⁰

A sturdy clear plastic adjustable triangle — will save you hours each week. Plot angles from 0° to 90° in a jiffy. Accurate angular scale set quickly by a twist of brass thumb screw. You'll discover many other valuable features when you own a C-Thru Adjustable Triangle... get yours today.



C-Thru 12" SPEE-DOTTER... \$1⁵⁰

Draw dotted lines with one stroke of your pencil or pen. Clear plastic... may be used for drawing accurate parallel lines or as metric or inch ruler. Interchangeable templates produce evenly spaced sharp (a) dotted lines (b) dash and dot lines (c) dash and two dot lines as illustrated:



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Hundreds of case histories prove that a man with a Woodboss Saw is always in demand. You and Woodboss can earn \$200 to \$300 a week! Contract logging or sawing for city, county or construction companies; contract falling and bucking, cutting cordwood, to mention a few. Be your own boss with a **WOODBESS**.

Dept. 31 Write for free booklet and full particulars.

WOODBESS, INC. 2712 N. Mississippi Ave., Portland 12, Ore.

They Rebuilt a Farm in a Day

(Continued from page 125)

Another piece of equipment used in the demonstration was a new rotary scraper. It looks like a Rube Goldberg doodlebug, and operates on the principle of a water wheel. Its series of "paddle wheels" digs in and picks up a little dirt, carries it to the top and drops it through an opening into a cylinder, then deposits it wherever it is needed. It can be pulled behind any kind of tractor of more than 20 horsepower, and performs something of the same function as a carryall. Its advantage is said to be its ability to operate successfully in very dry, loose soil, often difficult to handle. It cuts about two inches at a time.

Two primary purposes are served by demonstrations such as the one on Bob Hardgrave's irrigated farm. First, interested observers see with their own eyes exactly what can be done with equipment already in their own farm yard. Second, they see the value of contracting for heavy equipment. Soil Conservation District members often decide either to buy such heavy equipment cooperatively or to schedule the work so the members can afford to bring in a contractor.

Mizpah Ranch started out in farm life as an orchard irrigated by an artesian well. The flow of the well is now sufficient only for household use. The river pumping system was inadequate to reach the high slopes of the farm. The rich river-bottom fields were being cut away; because of the slope of the upper fields, topsoil was washing away. During recent years the ranch has been chiefly a subsistence farm, producing enough food for one family's needs.

Hardgrave bought it last October. By next October, as a result of the demonstration, Mizpah Ranch will be able to support 12 milk cows, 15 to 20 sheep and a horse or two, all with permanent irrigated pasture; there will be food for 15 to 20 hogs and 200 to 400 chickens. Fields formerly useless for irrigation because of their slope are now contour-plowed and planted to orchard and vineyard. There's a big family garden. And during the 1948 growing season, cash crops on nearly 30 acres will include tomatoes, corn, beans, melons and squash, besides alfalfa, green manure and forage crops.

The careful program of crop rotation planned by the Soil Conservation District will be followed. As a result, the new farm which was "given" Bob Hardgrave will reverse its history. Instead of becoming worse, it will grow better and even more productive through the years to come.

PHOTOGRAPHERS, profit from your hobby! Enter the 1948 GRAFLEX PHOTO CONTEST!

**62 PRIZES TOTALING
\$5000.00**

Three classes! (A) Teen-agers (B) Non-professionals (C) Professionals. Two Divisions! *Action*: spot news, action, candid shots. *Feature*: portrait, pictorial, general salon work. Color section open to all groups! Lots of chances to win! Contest extends from September 1 to December 1, 1948.

GET ENTRY FORMS FROM ANY GRAFLEX DEALER

GRAFLEX INC.
ROCHESTER 8
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BUILD YOUR OWN 2500 WATT ELECTRIC LIGHT PLANT

All you need is an electric generator; a small engine to drive generator at proper speed; 2 dual sheaves; 2 V-belts; and a welded angle iron base. No wiring is involved, and you do not need to know anything about electricity to make this assembly.

Start out by buying the 2.5 KVA Leland Alternator shown above. It is a 120 volt, 60 cycle, single phase, A.C. generator, complete with radio filter box, and self regulating voltage. It must turn at 1800 r.p.m. for bright, even lighting. Requires 3 1/4 H.P. to turn generator at full load—so buy an engine of at least 6 H.P. to have plenty of reserve. We will ship you the GENERATOR ONLY, without pulley or belts, for \$125.00 freight prepaid. If your needs are urgent, we will assemble your set, using above generator and a 6 H.P. Salsbury gasoline engine, manually started, governor controlled, and ship to you \$297.00 freight prepaid. Same unit but with Ensign conversion to run on natural gas \$347.50 freight prepaid.

To eliminate time lapse for personal checks to clear, we suggest remittance by bank draft or cashiers check.

HOPFER & COMPANY
3124 EAST 14TH STREET, OAKLAND, CALIFORNIA

PRIZES

(A)	Action Division	Feature Division
1st	\$150.00	\$150.00
2nd	100.00	100.00
3rd	50.00	50.00
10 Honor Awards (5 in each division)—\$10.00 each		

(B) (C) each	Action Division	Feature Division
1st	\$350.00	\$350.00
2nd	200.00	200.00
3rd	100.00	100.00
10 Honor Awards (5 in each division) — \$25.00 each		

COLOR

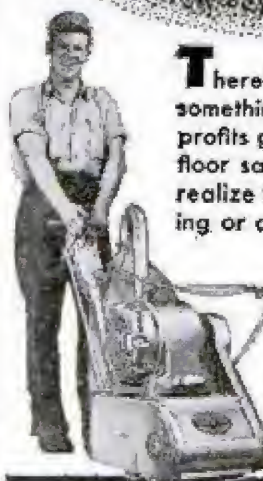
1st	\$350.00
2nd	200.00
3rd	100.00
10 Honor Awards — \$25.00 each	

Special Press Award — \$300.00 — open to all groups. Enter any photo published in a newspaper or magazine between October 1, 1947 and December 1, 1948.

NOTE: Only pictures made within the above dates with a *GRAPHIC*, *Graflex*, *Crown* or *Century* camera, anywhere in the world, are eligible in the contest.

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FLOOR SURFACING MACHINE CO.**

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- Gentlemen:
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3 to 1
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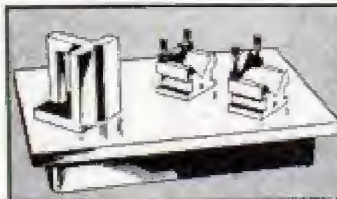
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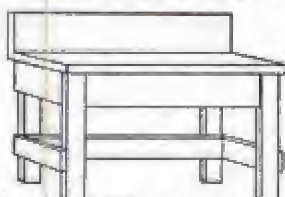
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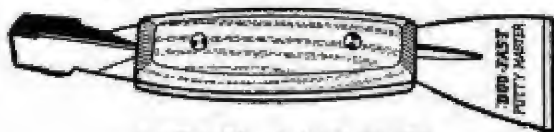
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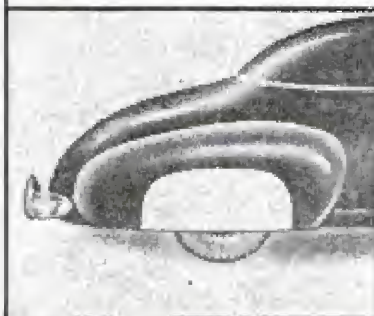
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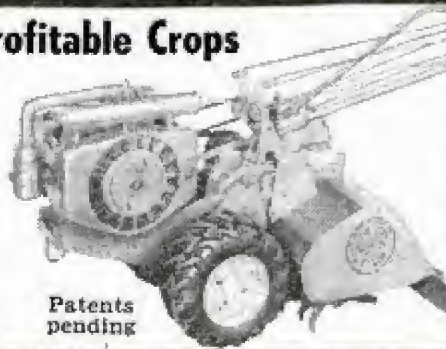
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Cuts 26-inch swath.

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Makes any cut wood-shaping tools costing up to \$300.00 can make more too. Sturdily built, lasts a lifetime.

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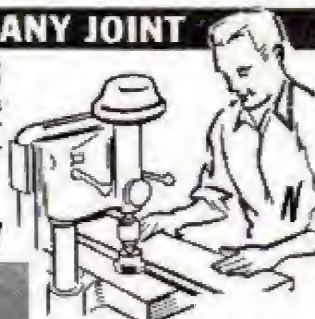
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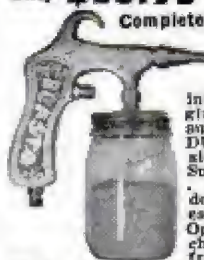
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Earn as much as \$400.00 a month in your basement or garage. Mr. Felber of Ind., writes, "MY UNIVERSAL GRINDER is faster and more accurate than any other grinder. Its efficiency enabled me to sharpen 450 mowers in 4 1/2 months. More than paid for itself the first month. Every customer satisfied." Mr. Hardy of Mississippi writes, "Received my Universal Grinder the first part of May and by August 18 had sharpened over 1000 mowers." Mr. Bacon of California writes, "The lawn mower business, with my Universal Grinder, has been a gold mine these last two years."



Only on the UNIVERSAL GRINDER can the inside face, the edge of the stationary blade, and the reel blades, be ground to proper clearance ALL IN ONE SET-UP WITHOUT REMOVING ANY BLADE FROM THE MOWER

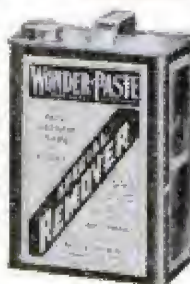
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Don't paint over a cracked or peeling surface. It's so easy to remove it with Wonder-Paste. Applied with a brush, Wonder-Paste softens up any number of coats of paint, varnish, enamel, shellac, or lacquer... reduces it to a soft, unresisting sludge that yields readily to a putty knife.

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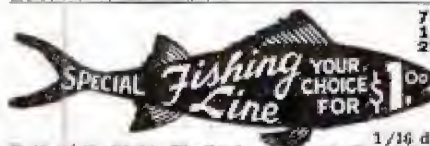
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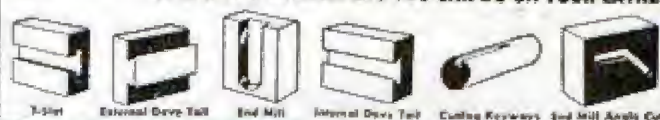
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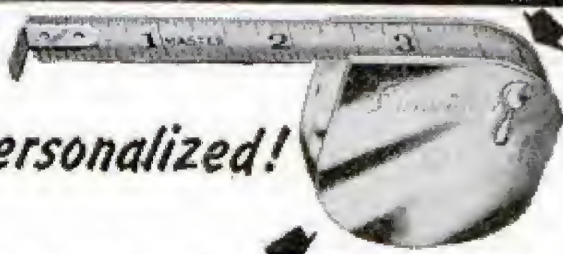
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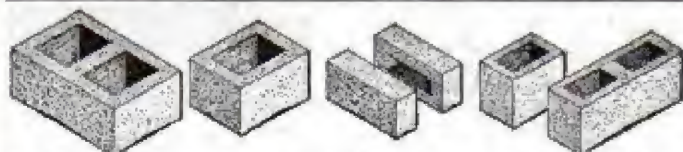
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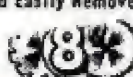
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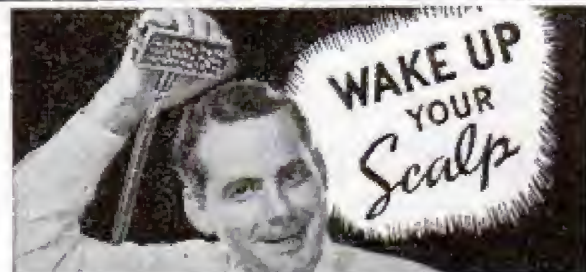
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SHAW DU-ALL

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PLOW



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SHAW MFG. CO.

These rugged walking or riding tractors are ideal for farm, truck garden, orchard, poultry farm. Operate on a few cents an hour. A child can handle them.

DO DOZENS OF JOBS Both riding and walking tractors quickly and easily plow, cultivate, harrow, disk, bulldoze, spray, haul, grind, saw wood, etc. LOW FACTORY PRICES Buy direct or through your dealer. Year's guarantee!

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A COMPLETE ELECTR-O-TOOL KIT

for only **14⁹⁵**

You get routers, sanding discs, buffing wheels, mandrels, chocks, grinding wheels, drill, wrench, rubber polishing wheel — all of the most popular accessories plus the famous precision-built Casco power-head with genuine fractional HP AC-DC motor—all in a sturdy tool box, everything for just \$14.95!



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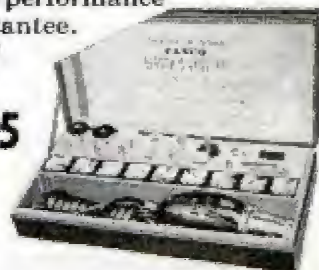
Job-tested in industry! Smooth vibrationless operation at 20,000 RPM. 14-part ribbed commutator turned within .0005. On-off switch for easy one-hand control. Oilless bearings. Unbreakable plastic Tenite case. Special safety sleeve and shaft lock. Non-slip chuck. Triple cooling for steady performance under load. 90-day guarantee.

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Electr-o-tool kit with famous Casco electric power-head and popular accessories. Sturdy carrying box.



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5 oz. Alnico Magnet, lifts 10 lbs. \$1.00. Our Leader, 15 oz. Magnet, lifts 40 lbs. \$1.00. New alloy—will not weaken! Useful for lifting valuables from tanks, trunks, or rivers easily! 7 small magnets \$1.00 with list of many shop and home uses. Satisfaction guaranteed.
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Send me a pair of JUMP BOOTS. Enclosed is check _____
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NAME _____
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CITY _____ STATE _____

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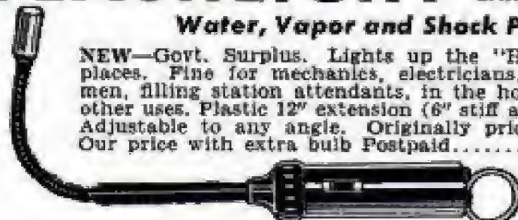
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Brand New General Electric: 1/2 hp 27 volts AC-DC. 2 stage piston type 1000 lbs. per sq. inch rated pressure 17 AMP series wound motor equipped with fan for cooling. Can be adapted to 110 AC with 27 volt transformer. Thousands now in use for spraying, inflating tires, laboratory use, etc. May be used with low-pressure paint spray gun. Shipping weight, 20 lbs., FOB, Kansas City, Mo. **\$17.95**
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Kansas City, Mo., Only

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Water, Vapor and Shock Proof



NEW—Govt. Surplus. Lights up the "Hard-to-get-at" places. Fine for mechanics, electricians, radio repairmen, filling station attendants, in the home, and many other uses. Plastic 12" extension (6" stiff and 6" flexible). Adjustable to any angle. Originally priced over \$4.00. Our price with extra bulb Postpaid..... **\$1.50 Ea.**

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NEW, IMPROVED

Modern—streamlined—fits the hand like a fountain pen! Easy to use as a pencil. Draws parallel lines—straight, curve or circular. Does expert job on autos, furniture, toys, bikes, model planes, signs, bulletins, linoleum. (Makes wall board look like tile.) Every painter and craftsman needs one! Type "M" MASTER Painters' Striping Tool complete with tip for 1/16" stripes, \$1.00. Extra tips 1/64", 1/32", 3/64", 1/16", 5/64", 3/32", 1/8"—75c each. Tool with complete set of 7 tips \$5.00. (C.O.D. orders 25c extra.) Paint dealers, write!

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You, too, can become a Hollywood Wolf. Give the wolf call and make other weird noises with the original HOLLYWOOD WOLF WHISTLE on your car. Precision made. Works off the intake manifold. Easily installed in 15 minutes.

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New ARMY MINE DETECTOR

AN/PBS-1 is a portable device for detecting Metallic and Non-metallic objects. You can use them to ferret out all kinds of Buried-Treasures, in the Mountains or on the Beaches. Its private use suggests the following: In the hills or mountains, all types of Metals and Non-metals; on the beaches any type of objects such as jewelry and coins. For commercial use such as tracing buried cable, wire and sewer tile. Locating buried metal or wooden boundary stakes, etc.

TECHNICAL FEATURES:

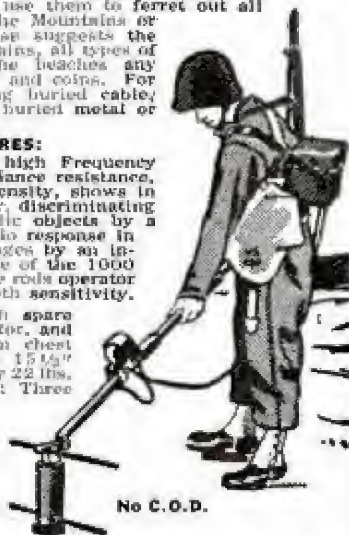
This unit actually is a Ultra high Frequency transmitter. A variation in radiance resistance, caused by any change in soil density, shows in a deflection of the Microammeter, discriminating between Metallic or Non-metallic objects by a swing to the right or left. Audio response in the Headset also indicates changes by an increase or decrease in the volume of the 1000 cycle tone. By lengthening dipole rods operator will be able to increase the depth sensitivity.

This unit comes complete with spare tubes, antenna dipole and reflector, and instructions manual, in wooden chest 9 1/2" height x 28 1/2" length x 15 1/2" depth. Weight in operation is only 22 lbs. LESS Batteries. Power supply: Three 45 volt and one 6 volt batteries. Uses standard batteries. Original COST \$285.00. Shipping Weight appr. 30 lbs. F. O. B., N. Y.

Our Special Price **\$26.40** with battery

\$17.50 without battery

Send Orders to: COLUMBO TRADING CO., INC.
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No C.O.D.

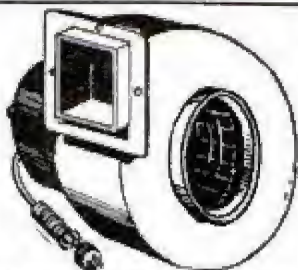
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SINGLE EXHAUST BLOWER DELIVERING APP. 100 CU. FT. AIR PER MINUTE. Ready to install yourself with any household tools. It's built for that. Housing is solid cast aluminum to last indefinitely. 110 V., A.C., 50-60 cycles. Cool, duty motor.

DOUBLE EXHAUST BLOWER, 2 heavy cast alum. housings. Double intake and exhaust. Only \$15.95. Add 50c handling; \$1 west of Miss.

Send check, M.O., Money-Back Guarantee. Free literature.

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MARCOT KEY MACHINES

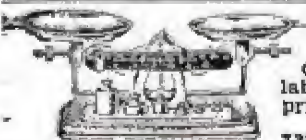
MARCOT No. 8 KEY MACHINE, mounted on Cabinet \$ 95.00
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How to Open Locks without Keys or Picks; Secret of Locksmithing; How to Make Keys by the Impression Method; Master Key Systems.

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IMMEDIATE DELIVERY—Motors available with Key Machine Orders.

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Balance 4"x9" Base. With either \$7.00 Metric or Avordupois Weights ..

Catalog with 3000 Illustrations of laboratory apparatus, and over 10,000 prices sent for \$1.00.

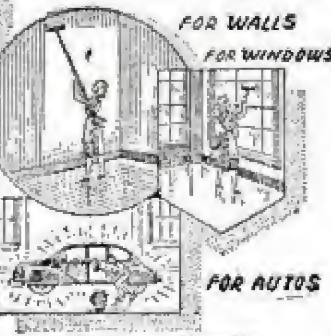
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Housewives Are Enthusiastic

Everyone that sees this outstanding Cell-U-Mop immediately wants one. That's the reason our distributors are so successful.



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FOR AUTOS

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Read What Others Are DOING!

"Enclosed you will find 56 orders representing 9 1/2 hours' work on Monday and Tuesday."

"Enclosed are twelve orders secured after supper this p.m."

Sales QUICK, EASY EVERYWHERE

SALES ARE EVERYWHERE . . . Sells quick to Taverns, Clubs, Hotels, Hospitals, Stores, Restaurants, Large and Small Buildings and the Homes . . . Scores can be sold on a single street . . . Note the Brain Bracket in the illustration . . . This squeezes out the water so thoroughly that HANDS NEVER TOUCH THE WATER . . . Makes no difference what you ever sold, you will like this proposition . . . Your name on a Post Card will bring you FREE PARTICULARS.

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DOES THE WORK OF 6 TOOLS IN 1 HOLDS 20 TIMES ITS WEIGHT IN WATER



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Look only to your doctor for advice on your ears and hearing

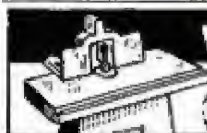


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Amazingly simple to install and operate. Just hook up terminals of two or more phones to any two-strand wire and you are ready to talk! Powered by standard flashlight batteries. Compact . . . rugged . . . portable.

Hundreds of uses for quick, low-cost, dependable 2-way communication around home, shop, farm, industry. Performance equals present-day commercial telephones. Up to six phones can be used efficiently on a single line, making a complete telephone system. No maintenance required. Each phone complete with self-contained hand-operated ringer. Every phone checked for perfect operation and fully guaranteed. Originally cost government \$39.90 each.

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 NEW WESTERN ELECTRIC FIELD PHONE HANDSETS, pst. pd.....4.75 ea.

We are the original firm to introduce Army Field Telephones on the national market. We deal exclusively in this item, and our experience in handling this equipment has resulted in the satisfaction of thousands of customers and many repeat orders.

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LOCATES RADIOACTIVE MINERALS

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Just The 3 Things To Stop These Leaks



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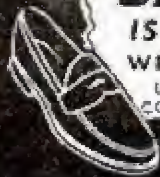
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Use P & H Nicast
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Nicast is ideal for making quick, easy repairs in cast iron, reclaiming cast-iron parts, and correcting machining errors

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This versatile P&H electrode operates equally well on AC or DC current. You can use it to reduce welding time and save money, no matter what type of welding machine you have.

And speaking of welding machines, we suggest that you get all the facts about the new

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Connectible to 220- or 440-volt current, the P&H Dial-lectric has many features that help to reduce welding costs. Here are a few that make for better, faster welding: Built-in remote control. Easy quick-start arc. High-low welding range. Elimination of arc blow. A three-quarter turn of radio-like knob for complete welding range. Compact design. Sizes range up to 650 amps.

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P&H Dial-lectric AC
Welder with built-
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Sizes to 650 amps.



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☐ Send representative ☐ Send address of distributor
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Name.....

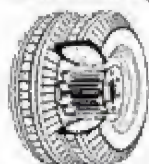
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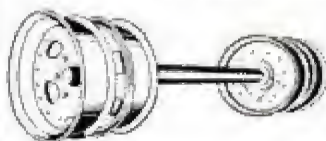
JEEP STANDARD WHEEL TREAD ADAPTERS. Extends width of tread to standard 58" width. Complete set for 4 wheels. No. TA 410.....**\$36.00**

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Axles, Trunion Bars, Pillow Blocks, Transfer Cases, Gears, Wheels, and every part for every G. I. type vehicle from jeep to 20 ton prime mover. 6x6 Stude., GMC, Dodge; 4x4 Chev., Dodge, Ford, Auto Car, Half track, Scout car, etc.

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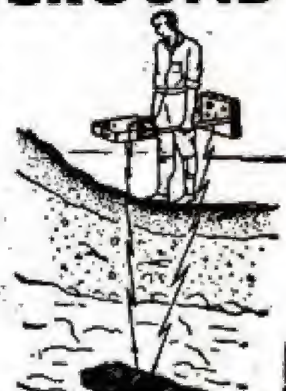
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PALO ALTO CALIFORNIA

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Powerful, double acting hydraulic units, all brand new. Length closed—3'. Extended—5'3". Makes a fine portopower for auto body work, hydraulic lifts, presses, etc. where positive power movement in two directions is desired. Gov't surplus. Only a few at **\$12.50** ea. Shipping wt. 10 lbs.



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Gasoline, burning 40,000 B.T.U., built by Stewart Warner for USAAF as cabin and engine heaters. Brand new and in original cases. Small modification makes ideal installation in trucks, buses, trailers, boats, small buildings, etc. No exposed flame. Crated shipping wt. 40 lbs. A bargain at **\$28.50** ea. FOB Wash., D. C.

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Brand new. First quality. Snowy white. Soft fine knit cotton. Sizes small, med., large.... **3 for \$2**

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Brand new. Air Corps surplus. Very soft, pliable leather, unlined. Ideal for driving. Sizes 9 and 10.... **2.25**

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Brand new. Air Corps Type B-15. Fully alpaca lined, including sleeves. Zipper front. Large mouton fur collar. Sizes 34 thru 44..... **14.95**



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Brand new. Navy N-1 Jacket. Fully alpaca lined. Zipper and button front. Sizes 36 thru 44..... **13.88**



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Brand new. Fine quality officers' elastic trousers. Sizes 29 thru 42. Reg. \$17.95 value.... **11.50**



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Brand new. Tempered steel 5 1/2 inch "Parkerized" blade. Laminated leather handle. Complete with sheath. **98c**



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12" DRILL PRESS



12" BAND SAW



THE ADVANCED DESIGN OF

SHOPMASTER TOOLS

*gives ease of operation
with professional results*

Whatever it is you make, a simple stool or an elaborate cabinet, it will contain that indefinable extra craft touch only you can put into it.

Most Americans have this ability to design and make things. They like to work with their hands. They know and take pride in good tools.

Shopmaster Tools have been designed to meet the needs of American craftsmen, both amateur and professional. Expertly engineered to give precise results with ease of operation, they have the rugged construction necessary for long years of service. And, best of all, they are priced within the reach of all.

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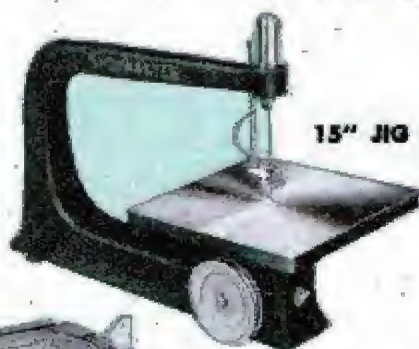
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LATHE



15" JIG SAW



SABER SAW



8" TABLE SAW



6" JOINTER-PLANER

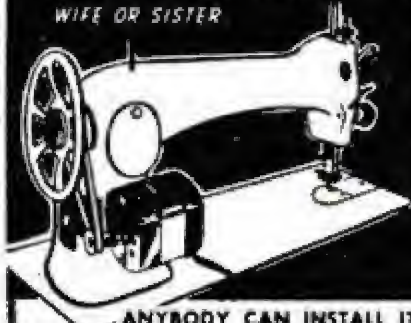


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ELECTRIFY YOUR SEWING MACHINE

IDEAL GIFT FOR MOTHER
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SEWING MACHINE MOTOR KIT...

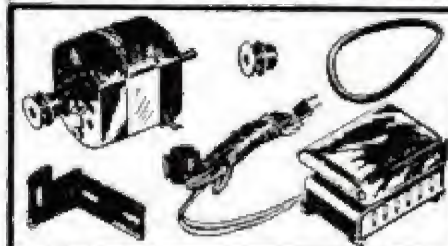
90 DAY
GUARANTEE

\$16⁷⁵
COMPLETE

ANYBODY CAN INSTALL IT!

ADJUSTABLE FOR USE WITH
ANY TYPE OF SEWING MACHINE

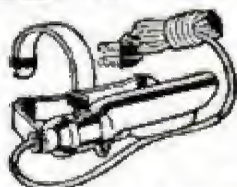
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Please rush your kit at \$16.75. The make of my machine is Handwheel turns: ☐ towards me ☐ away from me.

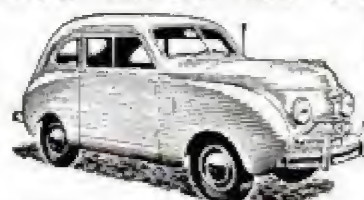
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To save postage and C.O.D. charges, I am enclosing \$16.75 ☐, check ☐, money order ☐. Send C.O.D. I'll pay postman \$16.75 plus C.O.D. fees

10,000 miles for \$53.17



All-steel Crosley 2-Door Sedan. Seats 4 huskies with plenty of room for luggage. Over 25,000 now on the road, operating for about 1/2 as much as other cars. Typical owner's report: Joseph Paper, 4663 Pimlico Rd., Baltimore, Md., drove his Crosley 10,000 miles, averaged 47 miles per gallon of gasoline. Total cost \$53.17. Five smart Crosley models to choose from—all with 4-cylinder, liquid cooled COBRA ENGINE.

CROSLLEY

a FINE car

For beautiful full-color catalog, write: Crosley Motors, Inc., 2532-HQ Spring Grove Ave., Cincinnati 14, Ohio

Home-Workshop Owners

SHARPEN CIRCULAR SAWS LIKE AN EXPERT



\$6⁹⁵

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COMPLETE INCL. 1 FILE

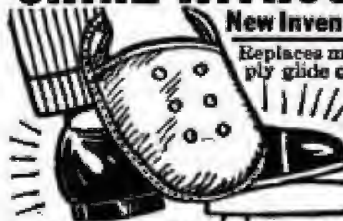
No waiting... no expense... keep circular saw blades sharp and true right in your own workshop. With SURE-SHARP anyone can do expert job on hollow-ground, cross-cut, and combination saw blades. Precision gauge—any pitch or angle! Can't miss in producing perfectly sharpened saw. Fits 6-in. to 12-in. circular saws with 1/2, 3/4 or 1-in. centers. Guaranteed!

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New Invention! • Sells Like Wild

Replaces messy pastes, liquids. Simply glide over shoes—and PASTROL—you have a lustrous, long-lasting shine. No mess. No fuss. No soiled hands. Clean, Handy. WORKS LIKE MAGIC! For Men's, Women's and Children's Shoes. Low priced. Lightning seller!

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Sample offer sent immediately to all who send name at once. A penny postal will do. **SEND NO MONEY—just your name.** KRISTEE CO., 688 Bar Street, AKRON, OHIO

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All-Purpose

DYNAMIC Super Charged ARC WELDER

Industrial Transformer Type

IT WELDS • IT BRAZES • IT SOLDERS

IDEAL FOR AUTO—HOME APPLIANCE AND FARM REPAIRS. This portable, industrial transformer type welder easily carried right to the job can be operated from any convenient properly wired 110 Volt 60 Cycle line. Can also be supplied for 220 volt 60 cycle operation and other voltages and cycles at slight additional cost.

EASY-TO-OPERATE. If inexperienced you can easily learn to do a variety of high grade welding jobs by following the practical, simplified Welding and Operating Instructions furnished. Once you see the DYNAMIC WELDER in operation you won't want to be without it. Its simplicity will amaze you. In a year the DYNAMIC only costs you about 7c a day. Comes complete ready to operate with helmet, rods, cables, holder, operating and welding instructions, etc.

SAVES YOU VALUABLE TIME AND MONEY!

DESIGNED TO DO HIGH GRADE WELDING inexpensively—Maintenance Men, Farmers, Mechanics, Machine Shops, Foundries, Auto, General Repair and Job Welding Shops, all using the DYNAMIC find it so indispensable and useful that they can not afford to be without it. Works on Iron, Steel, Brass, Bronze and Other Metals. Has 8 metallic and carbon arc heat stages. Does work you would think only possible with a larger, more expensive machine.

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ONLY
\$28⁵⁰
COMPLETE

DO YOUR OWN WELDING

Just a few repair jobs will pay for this machine. A practical and profitable machine tool for any workshop. Make money doing repair work for others.

Write for Particulars Get Details on our 10 day Trial Offer Member Chicago Association of Commerce.



You "PLATE" when you LUBRICATE WITH GRAPHITE!



Whether you apply a graphite powder, a graphite stick, a graphite grease or a graphite oil, an adequate amount of graphite becomes microscopically deposited or "PLATED" on the wearing surfaces!

This lubricating "plate" of graphite stubbornly resists the extremely destructive forces of friction, pressures, speeds, heat, cold and solvents that decompose or displace ordinary lubricants. You'll be amazed at how much

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There is a ready-to-apply GRAPHITE "PLATING" LUBRICANT for nearly every use in every home, industry, auto, boat, railroad, airplane etc. Illustrated here is one typical product of each of these four types of Dixon's Graphite Plating Lubricants stocked by the nation's supply houses.

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Dixon's Graph-Air Gun,
Type 4... 40¢



STICK
Dixon's Slipstik
20¢

GREASE
Dixon's Cup Grease
No. 3... 60¢ 1 lb. can



OIL—Dixon's
Lubricating &
Penetrating
Oil... 30¢



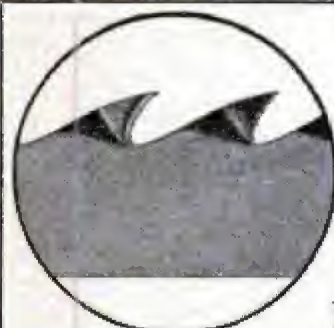
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Lasts five times as long.
Priced no more than other

saws.
Only the tooth is hardened.
The rest of the blade is left soft
and flexible (it can be tied in a
small knot!)

Pays for itself by eliminating
resharpening and brazing costs.

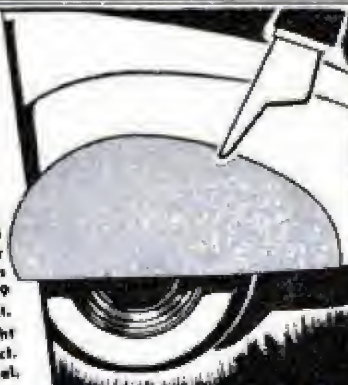
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literature and
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Install these "heavy steel" prime finished fender skirts yourself—and pocket a "substantial savings."—Your car will have that "new look!" Hooks on in a jiffy to any 1935 to 1949 model of the cars listed at the right. Enclose money order—save freight—or order C.O.D., freight collect. Specify car make, year and model.

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Huntington Park, Calif.



Order by Mail \$16⁹⁵

FORD OLDSMOBILE SUICK
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HANDY DUMP TRAILER!

Especially for your
fall garden clean-up!

Garden-All
LAWN and GARDEN TRACTOR

All-steel welded and
reinforced; 10-gauge
12" x 22" x 42" re-
movable body;
sliding end gate;
adjustable seat; Self-
aligning brakes.

Capable of hauling
1000 lbs.



Garden-All's Dump Trailer is so handy for hauling equipment to and from your garden. Or for leaves, brush, cut grass, manure or dirt. The body tilts to any angle desired. Remove the body, install the riding seat, and you have a riding sulky to use with

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PAT. PEND.



You polish and sand faster, easier — do beautiful, professional work—with this amazing new attachment for your hand drill. And it more than pays for itself the very first time you polish and sand your car, floors, woodwork, furniture. The Bull Buffer fits any chuck on an electric drill

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If your dealer doesn't stock, send cash, check, or money order for your Bull Buffer, complete as pictured below.....

\$9.95

ORDER THESE ACCESSORIES FOR YOUR BULL BUFFER:



Cup wire brush attachment for removing paint from that hard-to-scrape surface, \$1.75



Jacobs key chuck increases 1/4" drill to 3/4" capacity—reduces speed, increases power, \$5.00

- | | |
|---|--------|
| Bull Buffer car cleaner | \$.50 |
| Bull Buffer car polish | 1.00 |
| Extra sheepskin bonnet | 1.25 |
| Extra sanding discs (000-00-0-1-2 1/2-3-4) .. | .10 |
| 1/2" Jacobs No. 6425 key chuck (see photo) .. | 5.00 |
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Bull Buffer comes complete with 5-inch rubber disc, sheepskin bonnet, and 2 sanding discs, only \$9.95.

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Adjustments easily made to proper clearance and maintained for many thousands of miles.

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"Tappets Are Our Business"

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DYNAMOMETER TEST

With adjustable tool rests and removable cast wheel guards for buffing. Diamond-trueed 4" x 1/2" coarse and fine wheels . . . dust proof bearings . . . off-on switch . . . 6 ft. rubber cord . . . baked hammertone finish . . . 110-120 volts a.c., 60 cycle . . . guaranteed one year against defective workmanship or materials. Send check or money order, we prepay postage.

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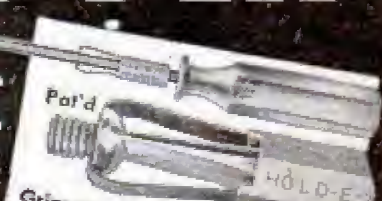
HOLD-E-ZEE

AUTOMATIC GRIP
SCREW-DRIVERS

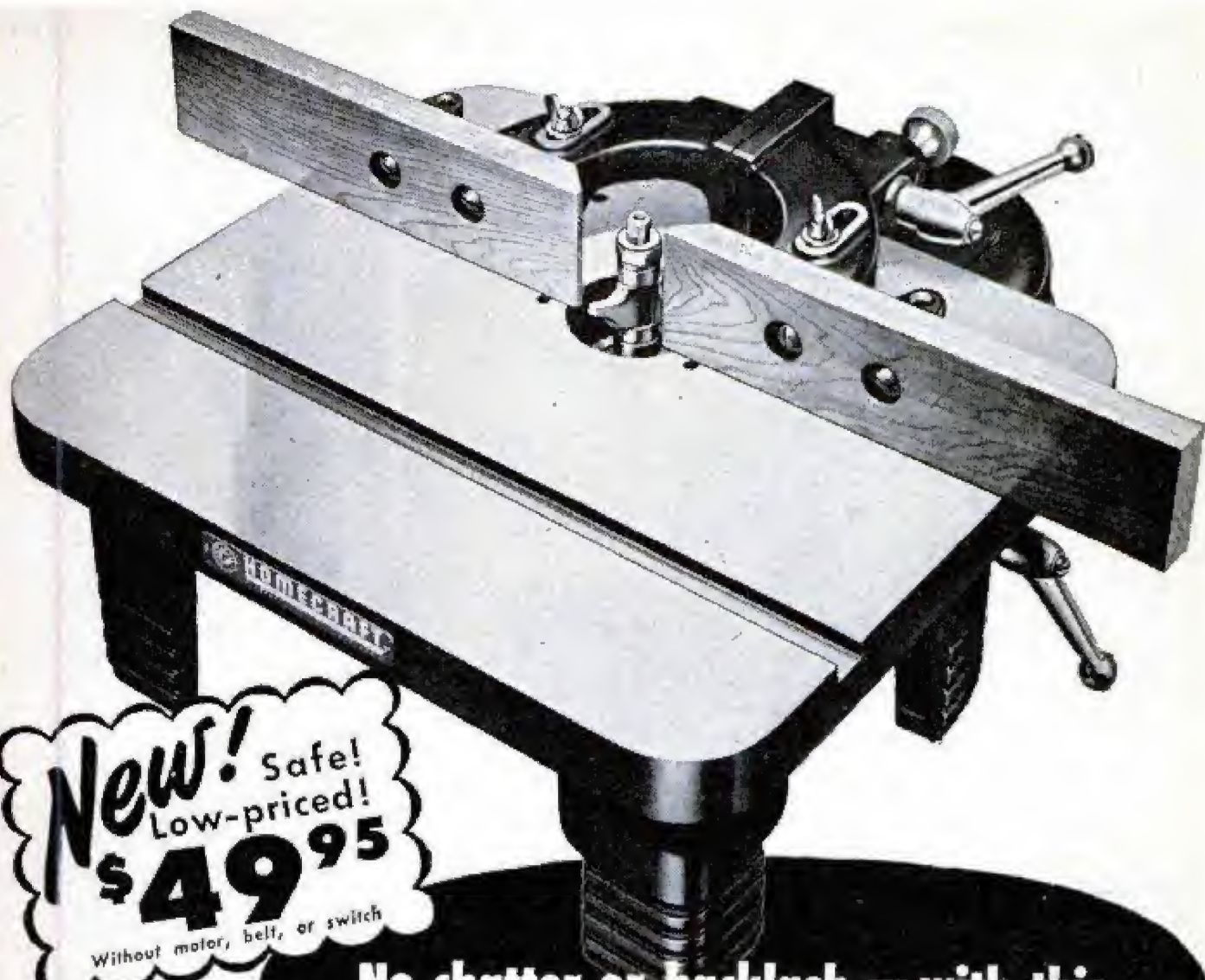
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QUALITY

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EXCLUSIVE GRIPPER

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Gripper slides up out of way when not in use. Insulating handles. Complete range of sizes. AT LEADING DEALERS EVERYWHERE



New! Safe!
Low-priced!
\$49.95
 Without motor, belt, or switch

Price subject to change without notice.

No chatter or backlash — with this **HOMECRAFT® SHAPER**

No. 43-110

This *Homecraft* Shaper is "made to order" for you, the hobbyist. It is low in price. You don't pay for size and weight you don't need. But — features like these add up to a lot of shaper for the money:

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- Belt and motor pulley and spindle pulley are completely guarded.
- Shaper runs at 9,000 r.p.m. — for smooth, clean work — and can be reversed.

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POWER TOOLS

General Sales Office — Chicago 2, Illinois

TEAR OUT COUPON AND MAIL TODAY!



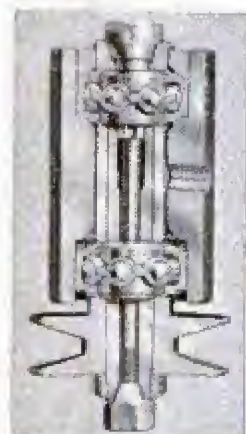
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 It's your guide to
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HM-60



Short, stiff spindle runs in closely-spaced ball bearings that are lubricated for life. This cuts out whip and helps prevent chatter.

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are built by the makers of Delta-Milwaukee® Power and Machine Tools — the tools with a widespread reputation for safety, accuracy, and dependability, in factories and schools, as well as thousands of home shops.
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 America's Thriftiest Power Transportation



With all necessary attachments
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BUILD IT, FIX IT
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"IT STAYS STUCK!"



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4" Central	6.25
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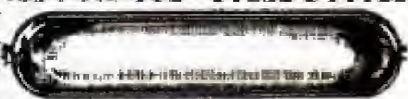
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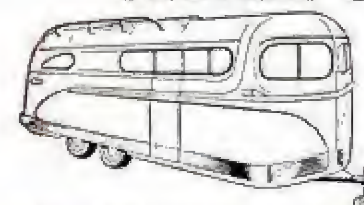
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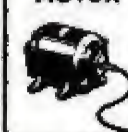
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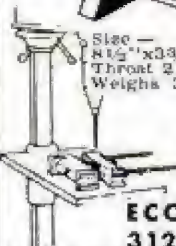
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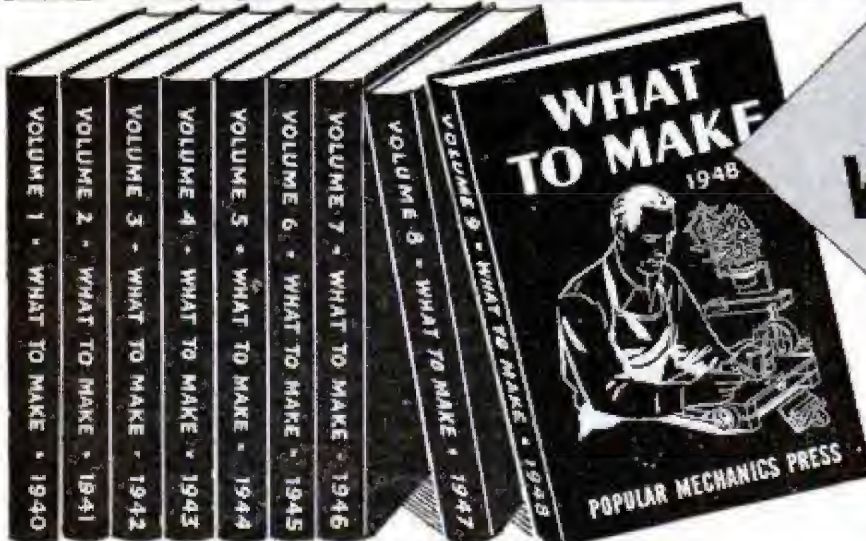
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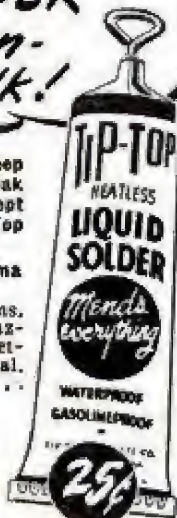
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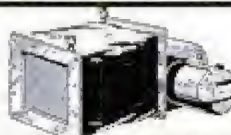
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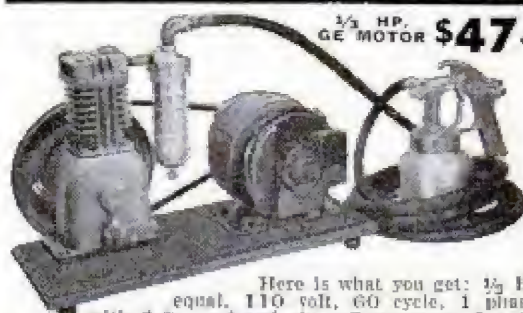
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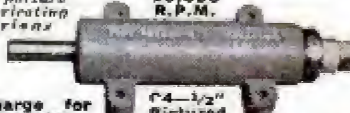
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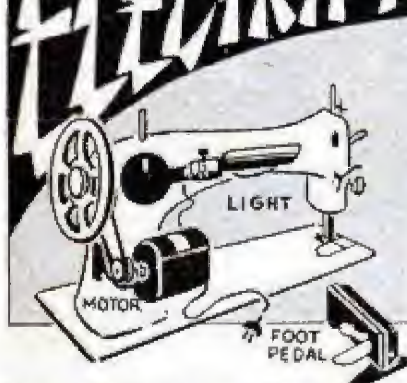


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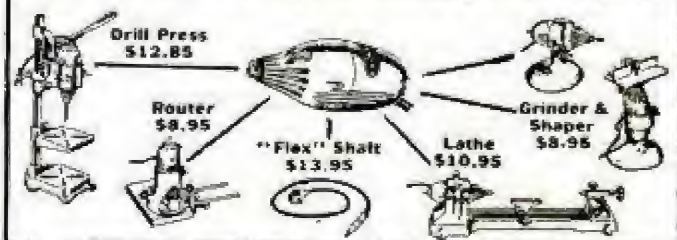


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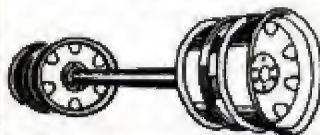
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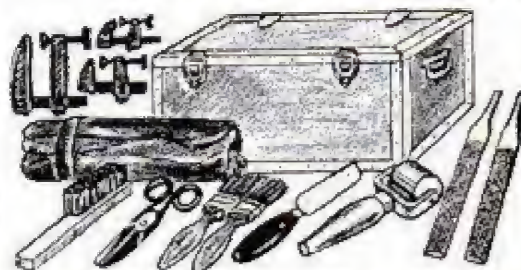
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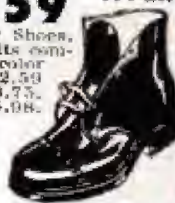
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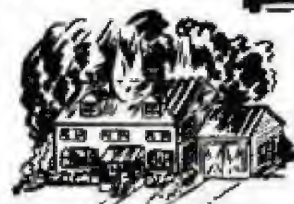
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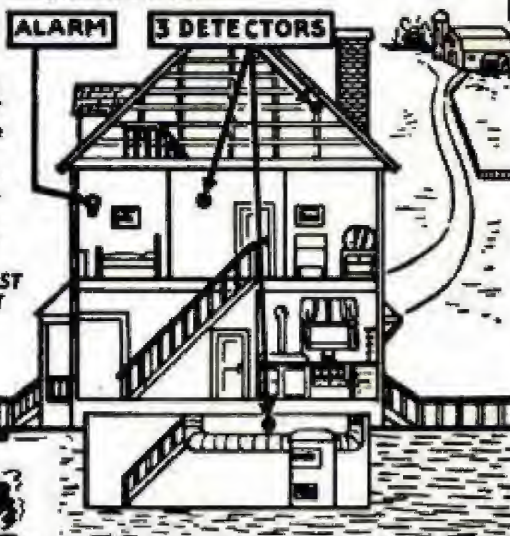
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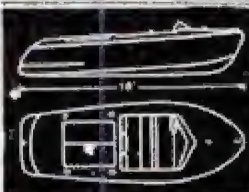
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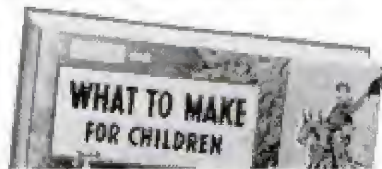
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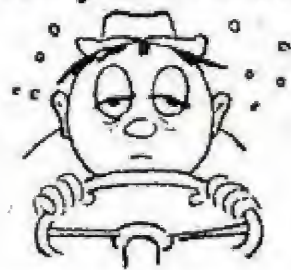
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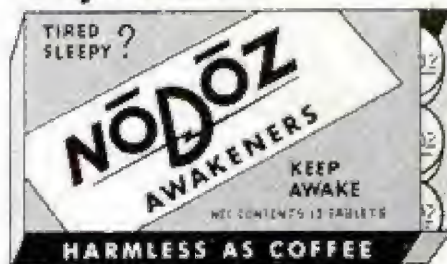
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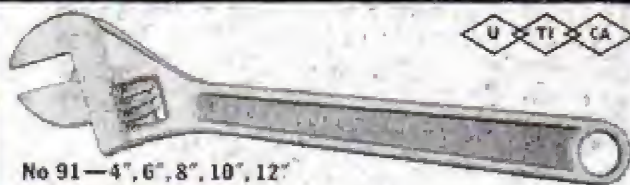
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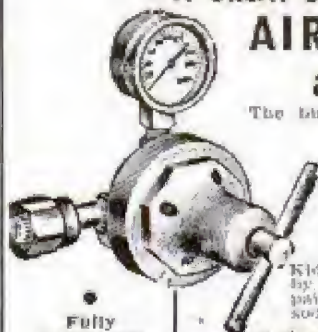
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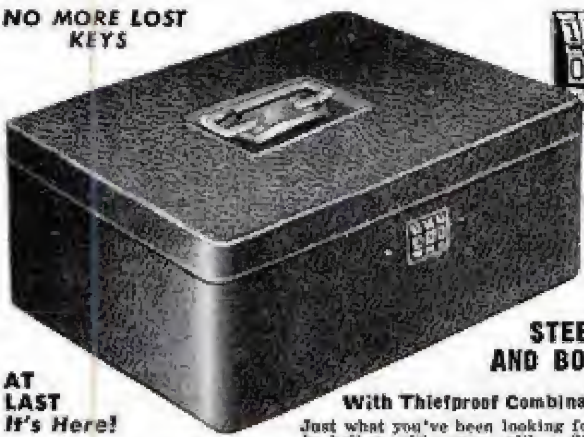
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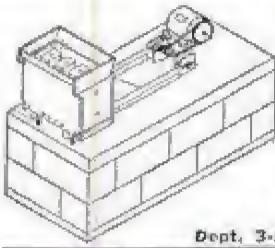
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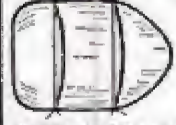
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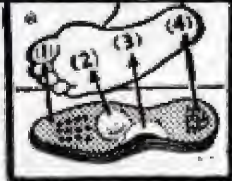


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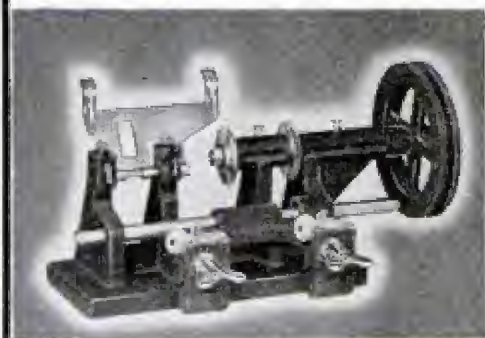
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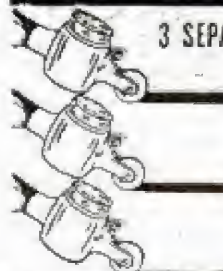
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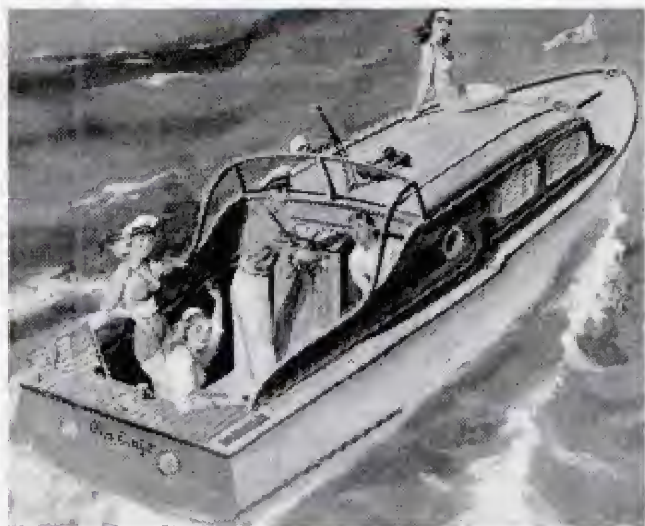


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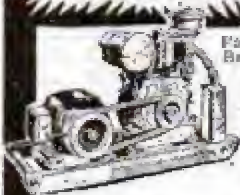
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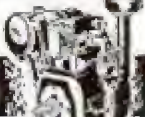
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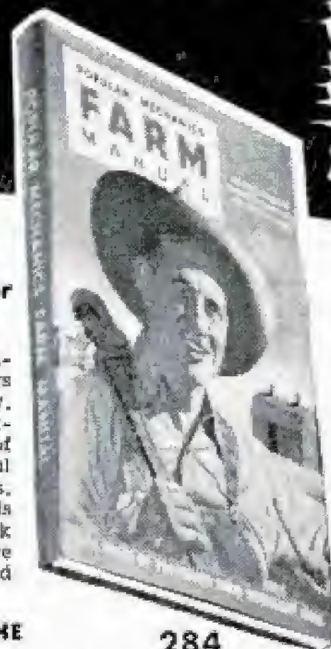
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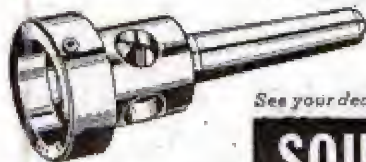
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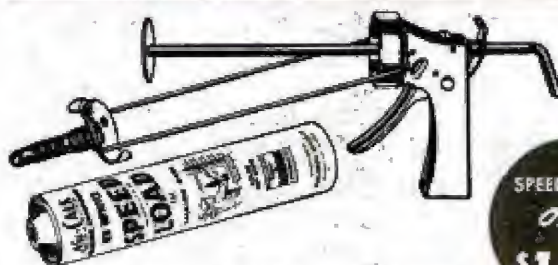


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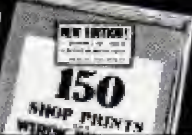
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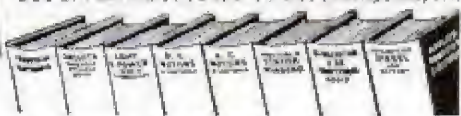
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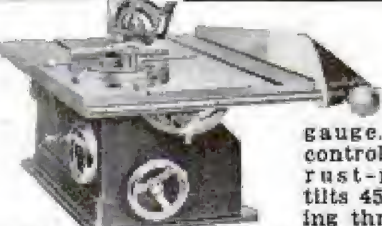
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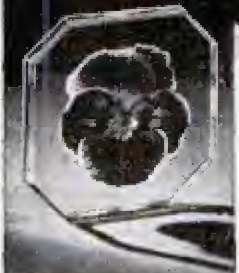
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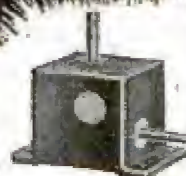
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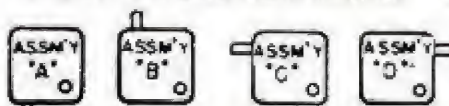
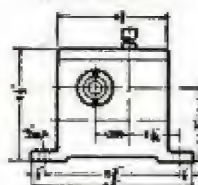
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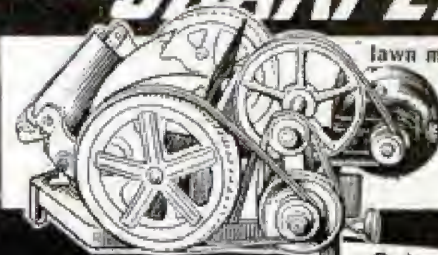
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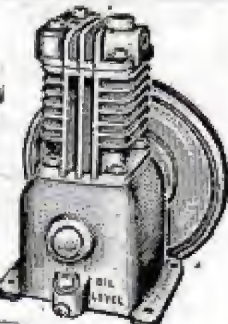
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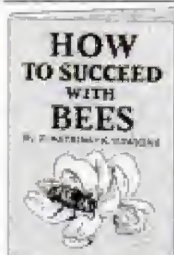
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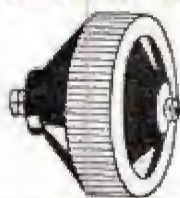
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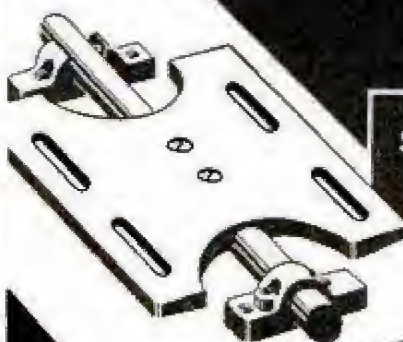
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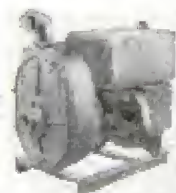
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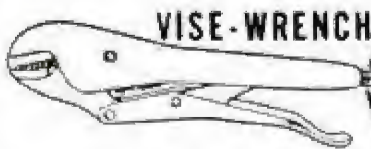


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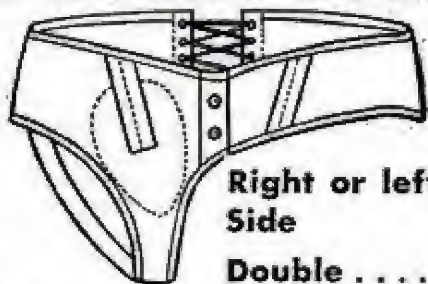
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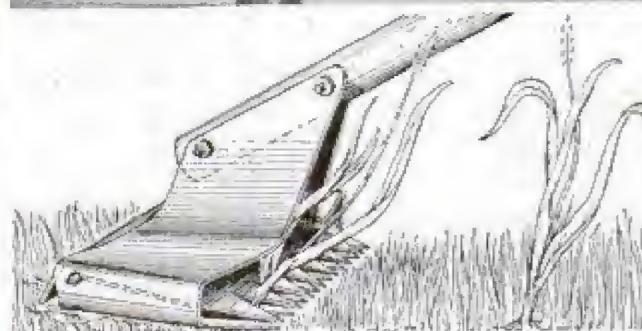
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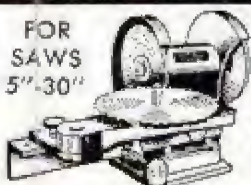
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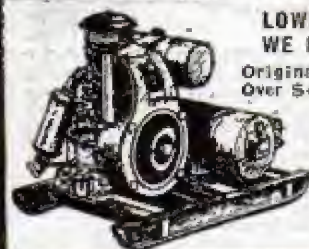


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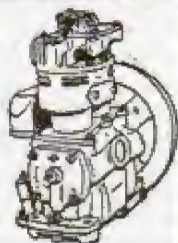
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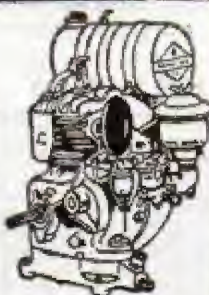


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BUILD YOUR OWN—Wagons—Scooters—Soap Box Racers—Welding Carts—Baby Pens—Etc.
To order above wheels write number wheels wanted in space provided, tear out and mail this ad with check or money order and your name and address. If other sizes are wanted write for FREE LIST.

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To prevent dropping and possible damaging of an electric shaver, a razor guard with chain attached is available. The guard is secured by removing one of the screws from the case and replacing it with a longer screw furnished with the guard. A loop on the end of the chain is worn over the thumb.

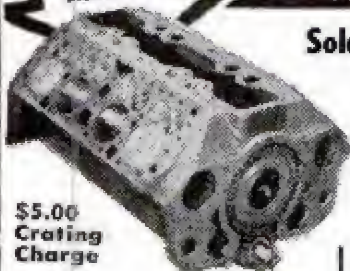
Hand Clutch Control for Tractors

Tractors can be operated with less fatigue with a new hand clutch control that can be installed without drilling any holes in the tractor frame. The clutch permits positive control of the tractor while the driver is standing. It also is helpful when engaging the tow bar of farm implements and eliminates the danger of muddy shoes slipping off the foot clutch. The hand control is made in models to fit Allis-Chalmers and Farmall tractors and does not interfere with use of the foot clutch pedal.



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Our Finest Precision REBUILT MOTOR BLOCK ASSEMBLIES



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DE SOTO Outright Exch.
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DODGE—3 1/4" bore Exch.
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Rebuilt by skilled mechanics. Assembly has Robored Block with New Pistons, Pins, Rings, Reground Crankshaft, all New Bearings. Guaranteed 90 Days.

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We ship at outright price. Send your motor prepaid, must be suitable for rebuilding. Send in notarized bill of sale showing title number if any. We refund difference when we receive your motor.

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35-47 V8 .. 149.00 99.00

**HUDSON-
TERRA.** Outright Exch.
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MERCURY Outright Exch.
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37-47 6 cyl. 175.00 135.00
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NEW Tailor Made **CONVERTIBLE TOPS**

Choice of Black or Tan. All Tops
Tailor Made for Easy
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**Sensational
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As Low as
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"ZIPPER TYPE" REAR CURTAIN

Each top packed complete and consists of main top proper, rear curtain and all needed bleeding and fittings. (Glass is not supplied—use glass from top being replaced). Heat quality, laboratory tested—equal to or better than the original. All metal parts are of heavy bright chrome plated rust resistant. Tops are heavily stitched with treated thread and sewed for durability and appearance.



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Cadillac	1936-48	41.75	Terra to '38	1936-40	\$39.95
Chevrolet	1936-48	39.50	HUDSON	1941-47	46.95
Chrysler	1935-38	33.00	LASALLE	1936-40	41.75
Chrysler	1940-48	39.50	MERCURY	1939-42	37.95
DE SOTO	1935-38	33.00	MERCURY	1946-49	39.95
DE SOTO	1940-48	39.50	NASH &		
DODGE	1935-38	33.00	LAFAYETTE	1937-41	39.95
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FORD			PACKARD	1936-48	45.95
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1936-42-5 Pas. Cb. Cpe.	37.95				
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NOTE: Specify color wanted also Model or Series, Body Style, Year & Make when ordering.

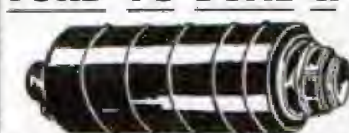
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Black satin finish, made of aircraft aluminum with stainless steel center strip, Ultra-Modern Air Flow Styling. No drilling—engineered to fit most cars. Adjustable for height and width. No painting required. Glare proof underside. Individually boxed.



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FORD V8 DUALS
Increases power. Reduces back pressure. Saves Gas.
MD20N-208—
Complete Set **\$15.95**

MUFFLERS that give that Motorboat tone

Made of high quality steel For:
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For most makes of cars including '49 Ford & Mercury. Made of all metal, prime finish, with Rubber beading to prevent rattle. Easy to Install.

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Per Pair
Be sure to specify year, make & model of car.

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60 HP. JEEP Engines

Reconditioned, Tested and Guaranteed in perfect running order and ready to run. Every part is checked to be perfect and carries a 90 Day Guarantee same as a new engine.

COMPLETE with . . . Generator, Starter, Distributor, Coll. Fan and Fan Belt, Water Pump, Fuel Pump, Intake and Exhaust Manifolds, Carburetor, Oil Filter, Spark Plugs, Flywheel, Clutch and Pressure Plate, Wiring.

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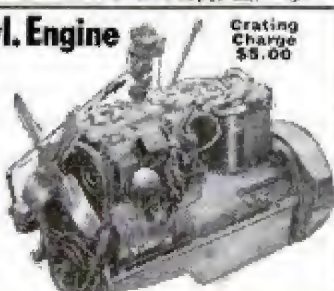


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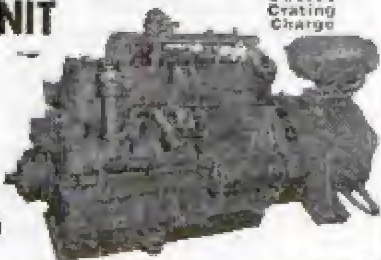


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RECONDITIONED!

Equipped with 6 cyl. RNLCT Hercules Gas Engine—4 1/2" bore, 5 1/4" stroke. Complete with Carburetor and Electrical equipment. 225 Volt—65 KW General Electric Generator is attached and develops 250 amp. D.C. current at 1800 R.P.M. Complete as shown.

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151—
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5 Carbon Steel Wood Bits with 1/4" diameter shanks for Electric Drills. • 13 Hi-speed twist drills. A complete range of sizes from 1/16" to 1/2" by 6-1/8". Indexed Drill Holder Keeps Drills At Fingertips
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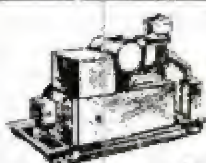
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New 750 watt 110 volt light plant with Briggs-Stratton model AP gas engine. **\$13500**

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Heavy duty, designed to pump water, oil, gasoline, etc. Will pump 35 gal. per min. Also used as vacuum pump. Includes lovejoy coupling for 3/4" shaft, 3/4" outlet, 3/4" inlet on bottom. Size of pump, 7 1/2" W x 5" D x 7" H. Compact and sturdy. Four mounting holes in base. Can be used with 1/4, 1/3, or 1/2 HP motors. **\$1695** new



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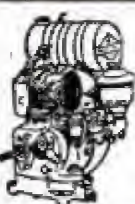
500 lb. Electro-lift hoist. 17 ft. of cable—up and down button and trolley. 3 phase, 220 or 440 volt, 60 cycle. Used in A-1 shape. List price \$185.00. OUR PRICE. **\$7500** Specify 220 or 440 volt



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Briggs-Stratton GAS ENGINES SAVE \$25

Rope start, 1750 RPM. All brand new and guaranteed. 2 1/2 HP Model AP... list price \$102.10. OUR PRICE **\$7700** 3 1/2 HP Model BP... list price \$86.00. OUR PRICE **\$111.50** 5 to 7 HP Model ZEP... list price \$137.00. OUR PRICE **\$91.10**



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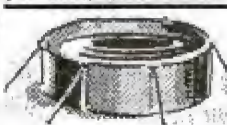


Extension cords, 100 ft. heavy duty. Plug, socket and guard. Number 10 wire. Worth at least \$10.00. OUR PRICE **\$485** Same as above—50 ft. **\$385**

Heavy Duty Electric Cable 3 wire #10 submarine cable—can be placed underwater, underground or overhead. Also for portable tools. Will carry 40 amps. 50 ft. **\$7.50** 100 ft. **\$14.00** 250 ft. **\$30.00**

RUBBER CABLE

150 ft. reels. 3 wire #6 with two 60 amp Crouse & Hines male and female connectors. Perfect for welders, hay loaders, saws, electric ranges, etc. List price \$190.00. OUR PRICE **\$4500**



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Backyard Swimming Pool or Water Storage Tank. Made of heavy glass cloth with rubber impregnation on both sides. Diameter 12 ft. Height 5 ft. Holds 3000 gal. of water. Ideal for small irrigation project, watering of animals or backyard swimming pool. Complete with cover, stays and guide lines. **\$3950** Cost Gov't approx. \$350. OUR PRICE **\$2800** Same size, made of canvas without cover. **\$2800** Due to handling, full amount is required with order on this item.



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Grinding and saw arbor. Has 1 1/2" double end shaft with 2 and 3" center step pulley. New Departure double roll precision aircraft ball bearings. Right and left hand thread. 10,000 RPM. Bearings alone sell for **\$595** \$4.50 each. Complete arbor only **\$595** new



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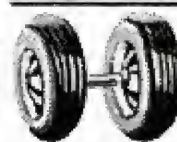
Motor driven, (not a vibrator) Heavy duty with great power and long life. 110 volt AC current. Weather proof. For alarm or signal horn on boats, school yards, factories, etc. List price \$47.00. OUR PRICE only **\$945** new

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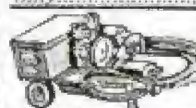
Keeps your hot water at any temperature you want. Can be set for 160° to 220°. Any handy man can easily install it on your water heater. Mfg. by White-Rogers, type 1190 size 8 fits 1/2" pipe thread. 25 amps, 110 volt AC-DC. 15 amps 220 volt AC. List price \$12.00. New **\$295** in original box.



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Hollow core rubber wheels made by Goodrich 2.75 X 10. Ball bearing. 150 or 3/4" bore. 3 1/2" **\$350** each across hub. RUBBER WHEELS (pneumatic) with tubes. Goodrich or Firestone. 6 x 6 with Timken bearings. High speed. 4 ply tire with overall height of 2 1/2", overall length of axle 42". 2 wheels with tires, tubes and axle. **\$3750** only.



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Hand truck job with Westinghouse Bendix, two cyl. compressor, 4 gal. tank, automatic pressure switch, pop-off drain, stop-cock, 25 ft. hose, blow gun, v-drive, air gauge, 25 ft. cord, 10" ball-bearing puncture proof Goodrich Silvertown tires, 100 lbs., 1/2 H.P. electric motor **\$12500** new

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Precision ohm tester. Used by Gov't for blasting. Has chloride of silver dry cell. Reads up to 25 ohms. Complete in leather case. List price \$22.50. OUR PRICE **\$495**



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(PNEUMATIC)

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You can use it to fix
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wood, metal sur-
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Designed and engineered for high speed sanding,
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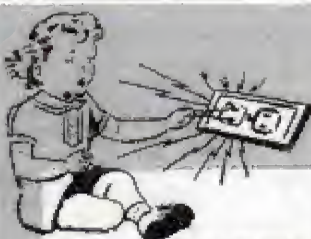


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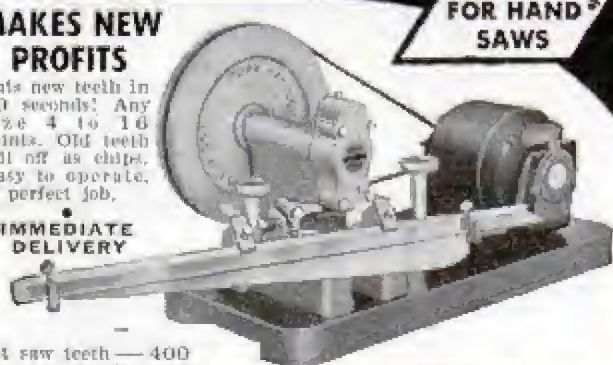
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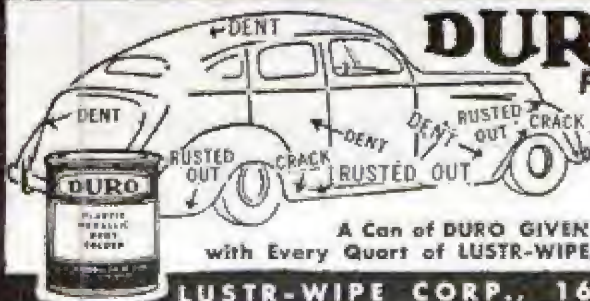
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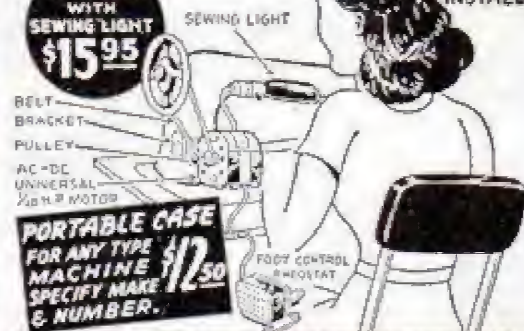
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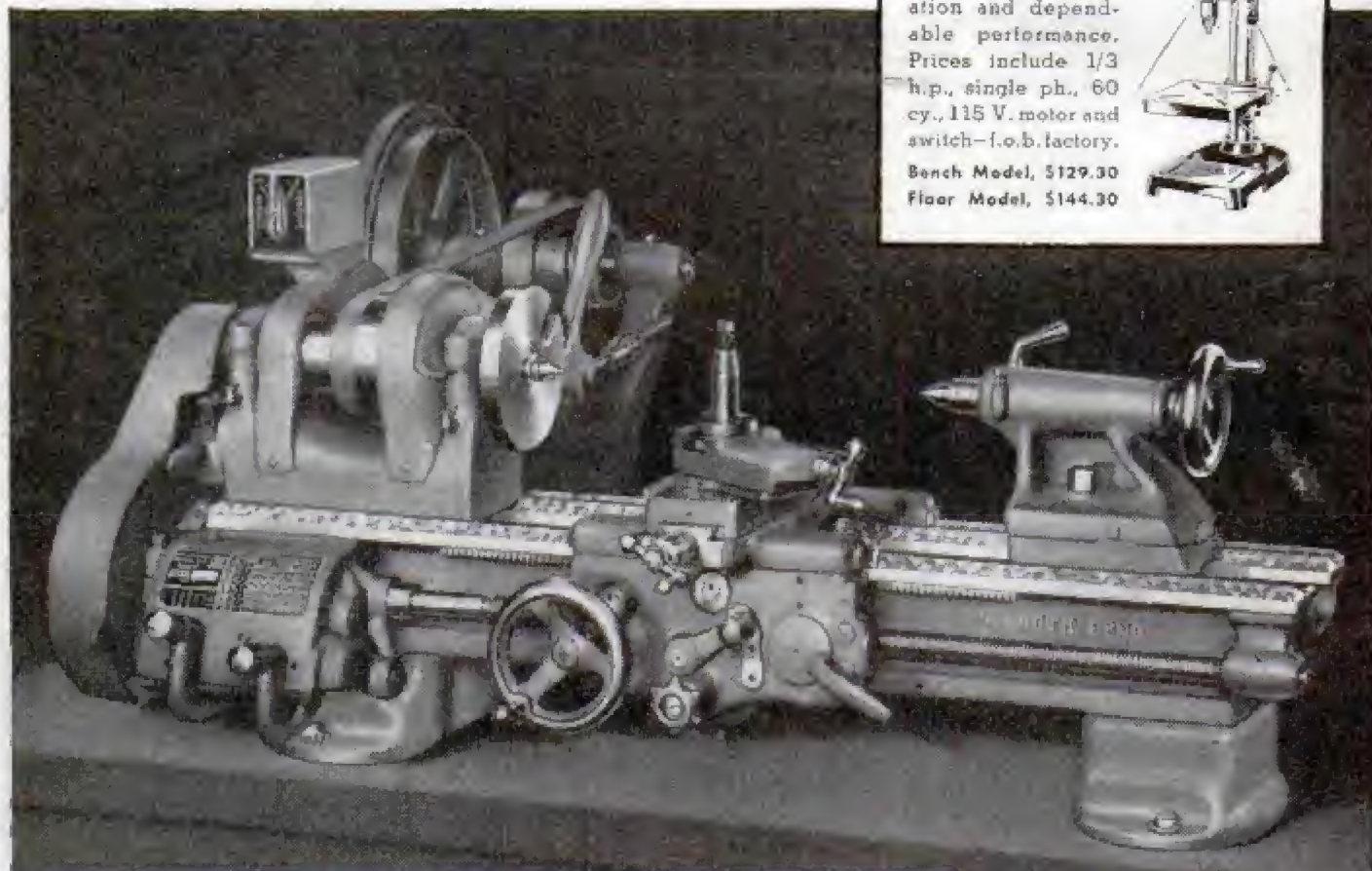
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